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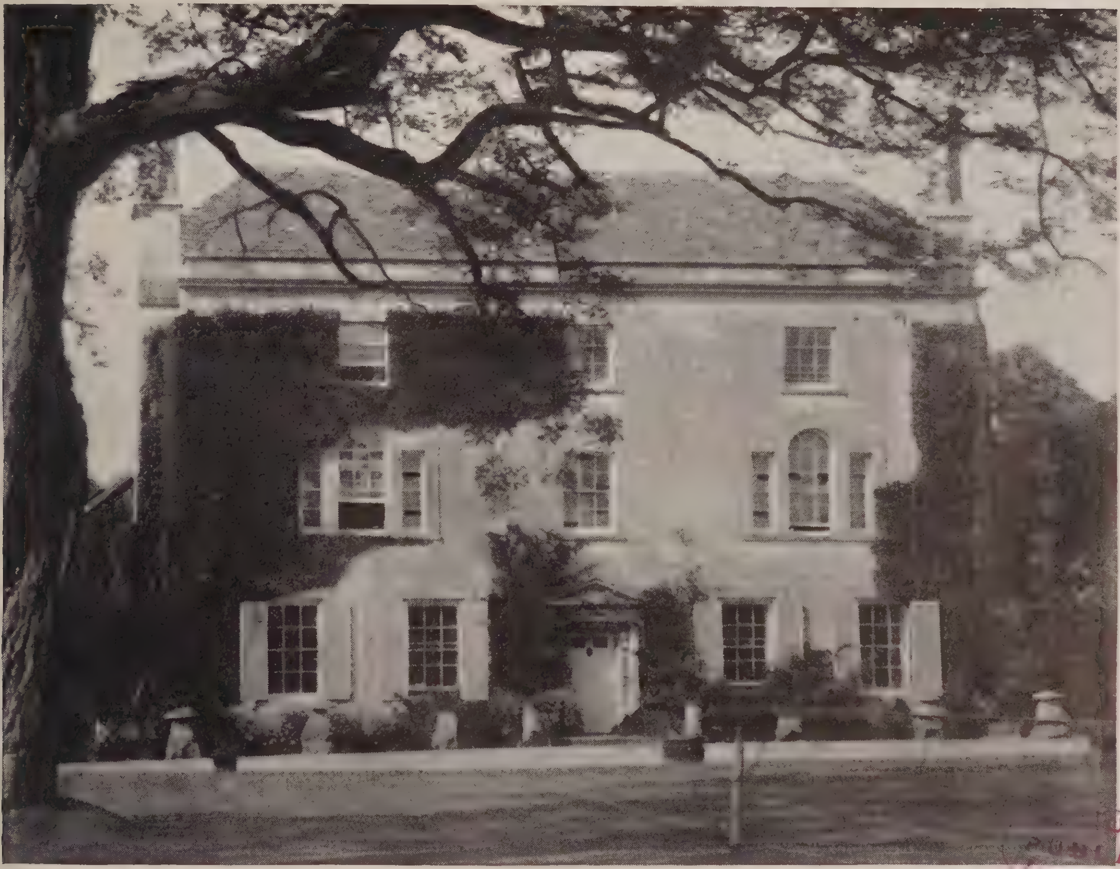

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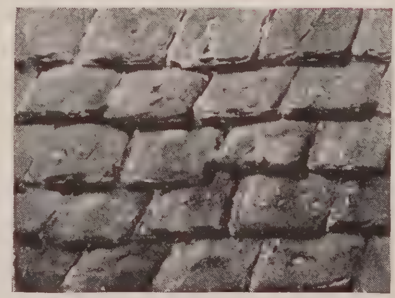

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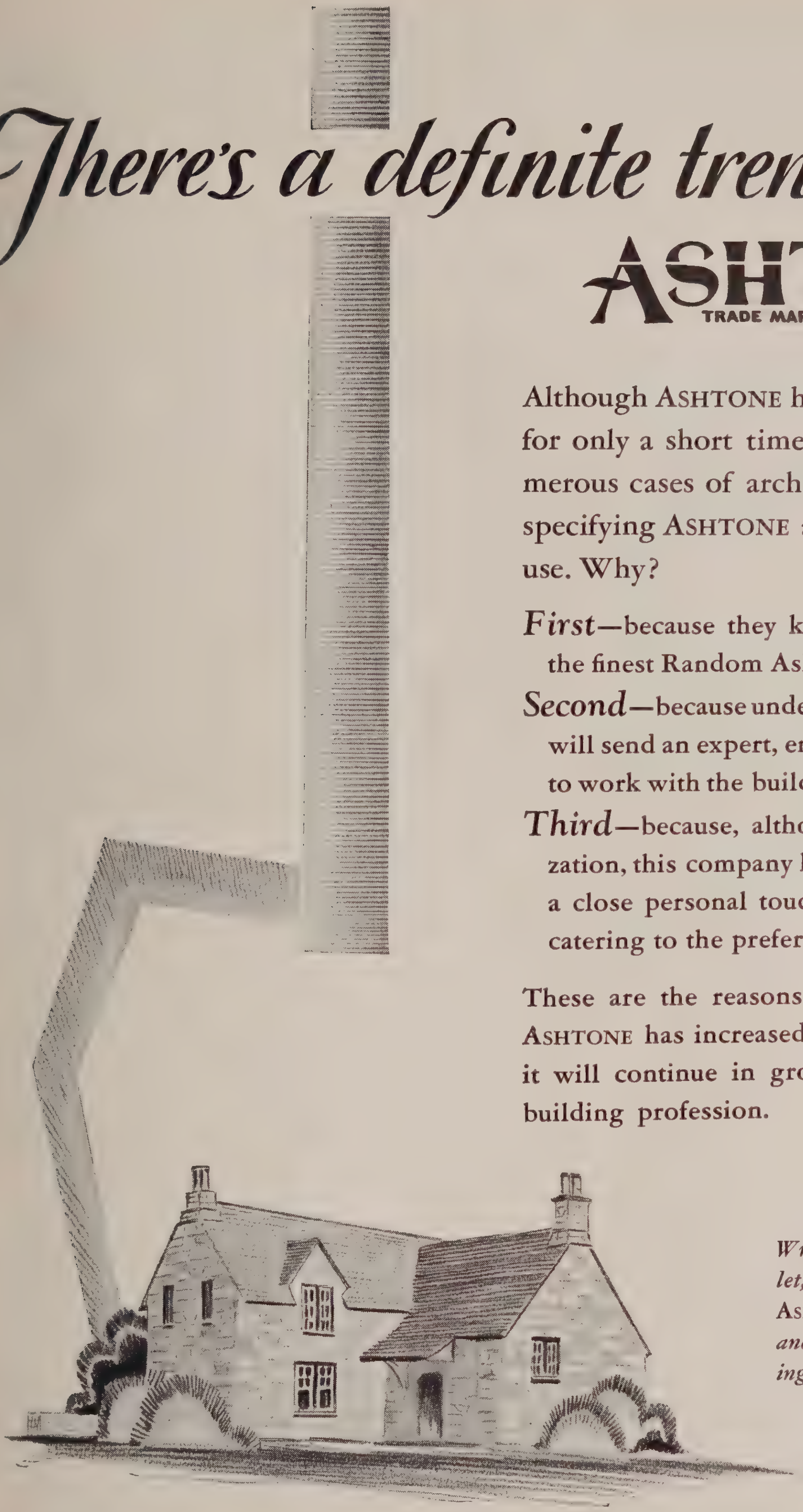

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BOOK DEPARTMENT

SPANISH ARCHITECTURE IN SANTA BARBARA

A REVIEW BY

CLIFFORD WAYNE SPENCER

OF all the different styles of architecture which have been developed in various parts of the United States there is none more distinctive than that based on Spanish influence and found principally in the southern and far western states. The climate and scenic characteristics of these states being somewhat similar to those of southern Europe, it is no more than natural that the architectural ideas introduced by the early Spanish explorers should take firm root in the new soil and undergo a remarkable development. This development naturally has been somewhat different in the widely separated states, such as California and Florida, and each has produced a variation on the Spanish theme distinctly its own. In this respect California has been especially productive of much architectural progress, the so-called "Californian" architecture being quite distinctive and expressive of the conditions and surroundings under which it was developed. It has combined much of the harmony, restfulness and color of its inherited Latin culture with some of the best of that American architecture which in other parts of the country is dominated largely by English precedent.

A Patio in Santa Barbara
Bertram Grosvenor Goodhue, Architect

The rich, luxuriant, semi-tropical vegetation of central and southern California, coupled with the brilliance of the sunlight, makes a delightful setting for buildings whose walls are a sparkling white, relieved by touches of brilliant color and set off by roofs of brightly colored terra cotta tiles. Other characteristics of these houses are the lowness and the flatness of the roofs. Seldom is there a second story, and the roofs rarely ever have a pitch in excess of 30 degrees from the horizontal. This lowness and flatness give the effect of causing the buildings to seem to hug the ground and to nestle picturesquely among the brilliant foliage. The lowness of the structures naturally necessitates a greater area in the ground floor plan, which usually is exceedingly irregular and rambling in form, adding greatly to the charm and interest of the exterior as well as to that of the interior. This distinctive type of architecture may be said to have reached the pinnacle of its development at Santa Barbara, where a large number of the leaders of finance and fashion have made their homes, with the result that this city with its surrounding communities has one of the most notable collections of large country places and fine small houses in the United States. Here also the plant life reaches its maximum in luxuriance and variety. There is very little difference between the temperature of winter and summer, and the gardens are filled with a profusion of rare and beautiful flowering trees and shrubs imported from the far corners of the earth to add to the already large variety of native plants and trees. It is said that Santa Barbara has the largest range of ornamental trees and varieties of floral culture to be found outside of botanical gardens anywhere in the United States. This profusion of vegetation provides the right setting for the simple white walled houses so characteristic of the Californian style. As is natural in a community whose residents have come from all sections and climes, there are many discordant notes and badly conceived ideas, but, taken as a whole, the city presents less of the usual jumbled architectural confusion than most other American communities.

RARY

A collection of illustrations depicting a large number of the most worthy examples of the purely Californian architecture of Santa Barbara has been made and published by H. Philip Staats, with an introductory article by Charles W. Cheney. This introduction is in the form of an interestingly written historical and descriptive sketch of the town and its architecture, preparing the way for the illustrations that follow. These were made from photographs by a group of six professional photographers of Santa Barbara, and the pictorial quality and architectural interest of the scenes shown leave little to be desired. Illustrations of four different classes of buildings are presented,—historical buildings, such as the Santa Barbara Mission and several old adobe houses; municipal buildings; churches, clubs and theaters; commercial buildings; and residences. The Mission of Santa Barbara is one of the finest in the state, and has had a very marked influence on the development of the so-called "Mission" style in California. This, together with the *Casa de la Guerra* and the *Carillo Adobe,* is the outstanding example of the architecture which has come down from the Spanish explorers. They depend for their claim to beauty rather on their romantic charm and the mellow quality resulting from age than on any outstanding architectural worth. On the other hand, the Ludington and Heberton houses, the *El Paseo* group and the Lobero Theater, though of a considerably later

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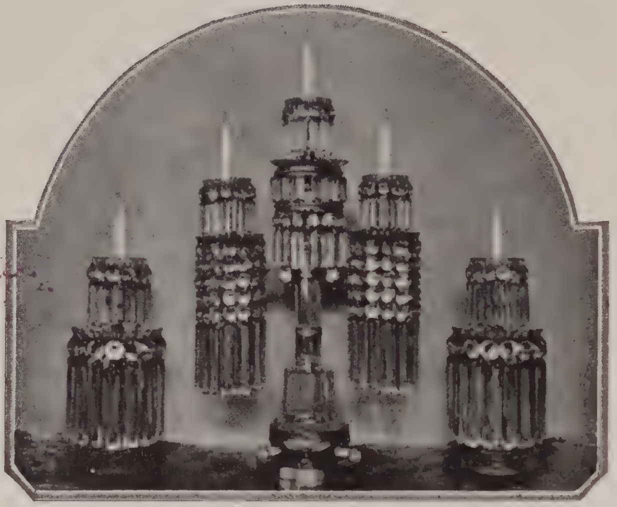

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period, combine many of the qualities that go to make satisfying architecture. In the Lobero Theater, the dominant note is that of massiveness, while the interior with its odd shaped auditorium, is a welcome exception in a class of buildings whose treatments have been almost consistently bad. Among the most recent additions to the city's skyline is the new court house which is notable for its extravagant bits of design, although the whole is somewhat loosely put together. The group of commercial buildings includes such structures as a railroad roundhouse, a filling station, banks, offices and shops, as well as the magnificent Santa Barbara Biltmore Hotel, combining all the advantages of a great northern hotel with the quaint old world charm so characteristic of the surrounding residential neighborhood. These briefly described examples are but a few of the many interesting and beautiful buildings presented in plan and illustration in this volume. The general type of buildings found in this locality are too well known to the architectural profession to require much description, since a large majority of the examples shown have already been represented in the pages of the leading architectural journals, and those who have seen these isolated presentations will readily realize the value of a work of 125 plates devoted exclusively to the architecture of a town which has the distinction of being one of the few places where a majority of the inhabitants are "architecture" minded.

CALIFORNIAN ARCHITECTURE IN SANTA BARBARA. Edited by H. Philip Staats, with a Preface by Charles H. Cheney. 125 pp., 8 x 11 ins. Price $7.50 Net. Architectural Book Publishing Co., Inc., 108 West 46th Street, New York.

SKYSCRAPERS AND THE MEN WHO BUILD THEM. By Colonel W. A. Starrett. 347 pp., 6 x 9 ins. Price $3.50. Charles Scribner's Sons, 597 Fifth Avenue, New York.

THE building industry is fortunate in having Col. Starrett to write its saga. One of the most successful of a remarkable family of builders, he brings to his task an all-embracing knowledge of his subject in its many aspects, a graphic style, and above all, an enthusiasm for his chosen calling which goes far to explain his success; for, as Col. Starrett clearly shows, it is no place for the dilettante or the faint hearted.

Forty-five years ago William Le Baron Jenney commenced his designs for the Chicago office of the Home Insurance Company of New York. This was the first of all "skyscrapers." It was only ten stories high, but in it were incorporated the features which led to the towering structures of today. During the previous 25 years, there had occurred the development of the passenger elevator from an impractical novelty to a serviceable (if slightly hazardous) means of vertical transportation. Cast and wrought iron columns and beams had been built into brick and masonry to lighten dead loads and help reduce the massiveness of lower walls, and already the science of foundations was emerging from the traditions of the middle ages. Wherein, then, did the first skyscraper differ from its predecessors? "Jenney went a long and daring step further," Col. Starrett writes. "He actually carried out what no one ever had done in theory and practice before,—took the dead load off his walls and placed it on a skeleton framework of iron concealed inside the masonry." The upper part of this framework consisted of Bessemer steel beams,—among

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the first to be rolled in this country. Many things were still to be done, and many discoveries to be made, before buildings of 30, 40 and 50 stories could be planned and erected, but that these things have come about in the span of a lifetime testifies to the courage, perseverance and ingenuity of the pioneers.

The capacity of the human mind to marvel is strangely limited. We exclaim at the apparent miracle of the radio one year, and complain the next of the quality of the reception or of the programs. In the same way, the replacement of a group of old buildings by an immense modern skyscraper in the space of a few months is so familiar a sight that the spectator may be forgiven for imagining it to be a matter of simple routine. He has seen the old buildings torn apart and removed,—he knows not where,—in trucks; he has watched with fascination the almost uncanny precision of the steam shovel as it scoops and nuzzles its way into the earth; he has heard the sharp staccato of the drills biting into rock; he has marveled at the skill and daring of the ironworkers as they build up the mighty skeleton tier by tier, and he has regarded with less lively interest the closing in of the building by the bricklayers. Of the foresight and planning that have made it possible for these operations to succeed one another without delay; of the engineering and structural problems that have been overcome; of the ways and means that have been devised to save time and money; of the ceaseless vigilance and the watchful attention over a myriad details,—of these the onlooker can have but a slight idea.

From Col. Starrett one learns all this, and more; the planning, designing, financing and estimating of the future structure; the taking of sub-bids and the letting of sub-contracts; the collection and distribution of information; the correlation of drawings, so that materials fabricated at a score of different points over the country will fit to a fraction of an inch when assembled at the building. He takes us through the steel mills, where the white-hot metal is rolled into a thousand shapes and sizes; through the fabricating shops, with the incessant clamor of riveting, where the structural shapes are built up into columns and girders, every one of which has been specially detailed and in which every rivet has been located weeks before. We are shown how a stone quarry operates and see the processes that ensue before the blocks of granite, limestone or marble are made to fit into their appointed places in the building. We learn the history of cement and the exacting requirements of its manufacture. And so on, through every phase of the construction of the building, we observe with him the romance of industry and the spirit of adventure which actuate the rank and file of a building organization. It is a continual fight,—waged against time, the elements, water, quicksand, and a thousand other difficulties which beset the builder at every stage. The parallel that Col. Starrett draws between the marshaling of the builders' forces and those of an army in the field, is well founded.

No book on building would be complete which did not consider the question of labor and the unions. Col. Starrett's criticism is constructive. The failure of the unions to attempt a solution of the intermittancy "which stalks as a spectre throughout the building trades mechanic's life" and reduces his yearly earnings to a little over a half-year's earning capacity; the absence of efficient machinery to deal with the problems of old age and sickness, and the economic,—and often senseless,—waste caused by the ever-recurring "jurisdictional" disputes, come under his fire. The benefits the unions have wrung from reluctant employers have been at the cost of hard fighting, and they are still hostilely arrayed in opposing camps. And yet Col. Starrett is not unsympathetic. His personal experience in the field has brought him into contact with the men as individuals, and he pays high tribute to their courage, their loyalty and resourcefulness in a crisis, and their ready generosity to one another when casualties occur,—as they do frequently.

As an economist, Col. Starrett takes a gloomy view of the present building situation, which he sums up succinctly in these words: "The building industry, disjointed, disorganized, with a clientele suspicious and largely uninformed of its complexity; with an architectural profession almost equally uninformed and clamoring for a recognition of superior knowledge of the problem which it never possessed and cannot maintain; with the banking and lending institutions throughout the country taking no stand for a stabilized industry, but relying on an assumed satisfaction with plans and specifications made in a medium they do not comprehend and written in a technical language that they cannot fully understand; with bonding companies as ready to insure the performance of an inexperienced beginner as an experienced builder, so long as the premium is paid; with importunate novices clamoring that they can build cheaper than any one else; with the sheriff waiting in the treasurer's office while frantic collections are being garnered in the banker's office to stave off for another brief period the hand of bankruptcy that overtakes 50 per cent of the kind in every five-year cycle;—is it not a wonder that absolute anarchy in the industry does not completely overwhelm it?" But, on the other hand, his exultation as a builder is contained in his own stirring words: "The thrill is always there, the unexpected is always happening; the satisfaction of planning in the welter of all this activity, and of having the plans come out right, of seeing the beautifully finished building come true and clean out of a complexity of elements that only a trained builder understands,—this is in itself an unparalleled triumph that gives a man the satisfaction of knowing that he is proficient in leadership."

The book, as Col. Starrett is careful to explain, is no attempt to present a technical treatise on building, but is intended primarily for the layman who desires to know something of the fundamentals that govern the science of modern construction, so that his understanding and appreciation, as a monster project takes form before his eyes, may be quickened. The book should do this, and more; it should give to the prospective owner a clearer understanding of the problems which confront him and of the pitfalls into which inexperience might lead him. To the architect, the frank exposition of the builder's viewpoint should bring a more intelligent perception of their mutual relationship to the problem in hand,—a relationship which, too often, is distinguished by antagonism and distrust.

The apprenticeship problem receives careful consideration. The European system of long periods of training for a thorough understanding of all phases of a craft has given way to the modern trend of specialization, and the "all-round" mechanic is a thing of the past. Instead we have carpenters specializing in the erection of concrete forms, others in the hanging of doors, others in the laying of floors, others in the installation of "trim," and so on. It is only in recent years that concerted action has been taken to raise the standards of workmanship and insure an adequate supply of newcomers to replace those incapacitated by years or injuries. This has been due to the efforts of the late Burt L. Fenner, of the firm of McKim, Mead & White, who devoted a great deal of his time to this important question and sponsored the plan leading to the formation of the Apprenticeship Commission by the New York Building Congress, whose scope is ever widening. The plan, in outline, consists of the training over a period of from three to four years of a certain number of boys as agreed upon between a committee of employers and representatives of the union. The curriculum is divided between work at the trade during the day and class work, usually conducted at night. The wages and scope of the training are determined by the committee, and a careful record is kept of the attendance and progress.

BUSINESS LAW FOR ENGINEERS. By C. Frank Allen. Third Edition. 475 pp., 6 x 9 ins. Price $4. McGraw-Hill Book Company, 370 Seventh Avenue, New York.

ARCHITECTS and engineers have much need of a working knowledge of law, particularly in its application to contracting and building. In these days when the activities of both professions seem to be undergoing radical change or rather to be extending their spheres of action, an architect (and presumably an engineer) is often compelled, even against his wishes, to become more or less of a promoter to bring new capital into an enterprise or else to further the development of some sort of a project; and most architects and many engineers know that they are at times called upon to act as arbitrators, referees or umpires between contractors.

This volume represents the third edition of a work already well known to those for whom it was written. Its author is a member of the Massachusetts Bar, of the American Society of Civil Engineers, and was formerly a professor at the Massachusetts Institute of Technology. "The purpose of this book is not to make 'every man his own lawyer,' but rather to give the engineer a sufficient understanding of important fundamental features of law, so that he may have some idea of when or how to act himself and when to seek expert advice, as well as to enlarge his horizon and perhaps encourage him to further study of law. Many engineers will find that there is some chapter which covers ground concerning which they are better informed than the author or even than most practicing lawyers. They will, nevertheless, probably find other chapters with which they are less familiar, and which may prove interesting." The work is divided into two parts, the first entitled "Elements of Law for Engineers," dealing with such subjects as Evidence, Contracts, Equity, Real Property, Agency, Sales, and Negotiable Instruments, while the second discusses Information for Bidders, Proposals, Uniform Contract Forms, Cost Plus Contracts, Bonds, and Specifications. The usefulness which has brought two editions into service should guarantee the favorable reception of a third by architects and engineers.

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The editors have been assisted in the preparation of the work by widely known hotel architects and interior decorators and by actual operators of hotels,—practical men, experienced in the management of the "back" as well as the "front" of a hotel. The volume's treatment of hotel furnishing and equipping constitutes the final word on this important subject. There are included views of hotel restaurants, cafeterias, kitchens, pantries, "serving pantries," refrigerating plants and all the departments which are necessary in a modern hotel of any type. The work is of inestimable value to architects and engineers, as well as to practical hotel men.

438 pages, 8½ x 11¼ inches—Price $10

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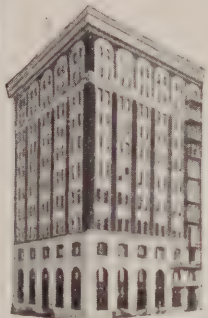
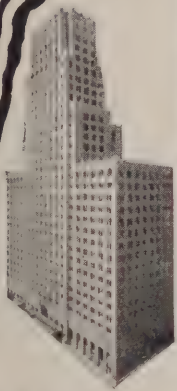
Terminal Sales Bldg., Portland, Ore. *Architects:* A. E. Doyle Co., Portland.

PORTLAND



Pacific Tel. & Tel. Bldg., Portland, Ore. *Architect,* A. E. Doyle, Portland.



Russ Bldg., San Francisco, Cal. *Architect:* Geo. W. Keilham.

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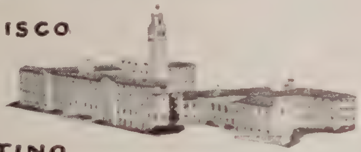
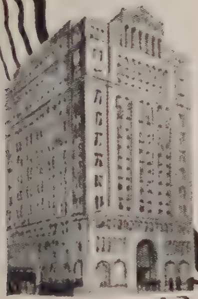


CUPERTINO

St. Joseph's College, Cupertino, Cal. *Architect:* L. J. Devlin, San Francisco.

Glendale Sanitarium & Hospital, Los Angeles Branch. *Architect:* Alfred Puest.



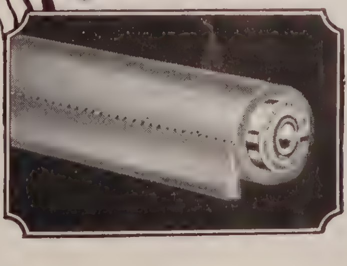
LOS ANGELES

LONG BEACH

Fine Arts Bldg., Los Angeles, Cal. *Architects:* Walker & Eiser.

National City Bank Bldg., Los Angeles, Cal. *Architects:* Walker & Eiser.

Breakers Hotel, Long Beach, Cal. *Architects:* Walker & Eiser.



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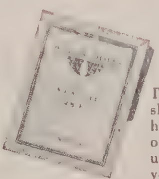

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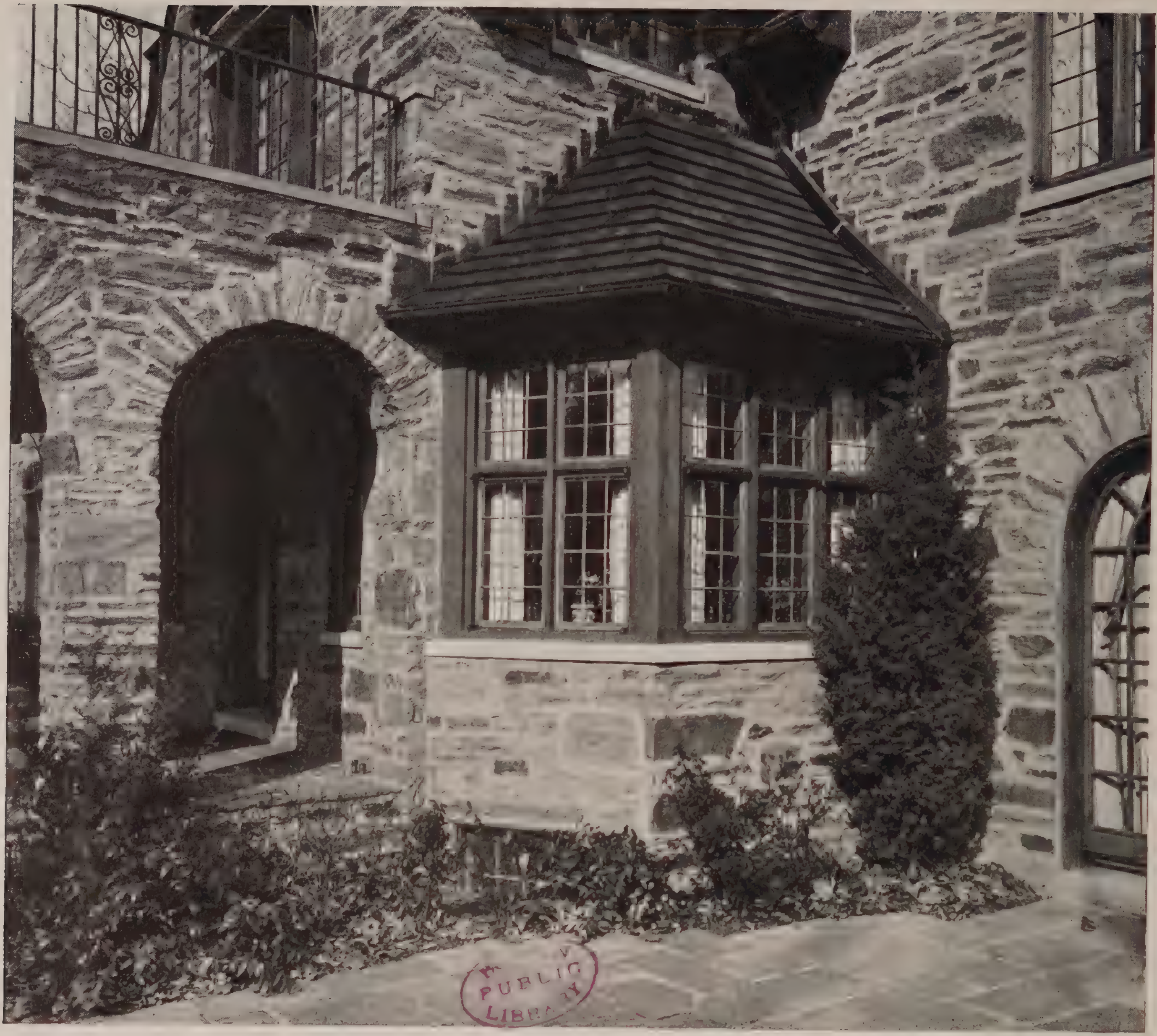

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THE EDITOR'S FORUM

CONTEMPORA EXPOSITION OF ART AND INDUSTRY

IT is now several months since record crowds attended the first Exhibition of Contemporary American Industrial Art at the Metropolitan Museum. The single large gallery in which this exhibition was arranged was totally inadequate to accommodate the enormous number of people who visited the exhibition every day. If any were in doubt as to the growing popularity of and the increasing interest in contemporary furniture and interior decoration, the great number of visitors should have convinced them. The spring exhibition of the American Designers' Gallery also elicited great interest on the part of the general public, and now within a period of six months a third exhibition of modern art in industry has been arranged by Contempora, Inc., in the galleries of the Art Center in New York. Of particular interest in the exhibition, arranged by members of this firm, all of whom are designers of international prestige, are the ensemble rooms which may be bought complete. Each room will be available in any one of six color combinations to suit the individual taste of the purchaser. The rooms are to be sold as units, thus obviating the arduous task of shopping for harmonious accessories. It is planned to create about 12 types of rooms, which will be commercially procurable at moderate prices. This exposition comprises seven harmonized rooms by Bruno Paul, Lucian Bernhard, Paul Poiret and Rockwell Kent, as well as textiles, lighting fixtures, ceramics, and an exhibition of architectural designs by Eric Mendelsohn.

COLUMBUS MEMORIAL LIGHTHOUSE ARCHITECTURAL COMPETITION

ANNOUNCEMENT was made lately by the Pan American Union of the names of the authors of the ten designs which were placed first in the architectural competition for the Columbus Memorial Lighthouse. The names of the winners are:

Rice Amon, New York.
Helme, Corbett & Harrison, and W. K. Oltar-Jevsky and Rogers & Poor.
Douglas D. Ellington, Asheville, N. C.
Joaquin Vaguero Palacios, Madrid.
Josef Wentzler, Dortmund, Germany.
Filippo Medori, Rome.
Louis Berthin, Paris.
Theo Lescher, Paris.
Donald Nelson, Paris.
J. L. Gleave, Nottingham, England.

The selections were made by an international jury, selected by the competing architects, who met at Madrid and consisted of Raymond Hood for North America, Eliel Saarinen for Europe, and Horacio Acosta y Lara for South America. The authors of the ten designs placed first by the international jury will now recompete in the second stage of the competition for the final selection of the design for the Lighthouse. Mr. Acosta y Lara, the South American member of the jury, is the president of the Uruguayan Society of Architects, Professor of Architecture at the University of Montevideo, and a member of the Central University Council. Mr. Hood, of New York, is a member of the American Institute of Architects and the Architectural League of New York. He was associated with John Mead Howells in designing and erecting the *Tribune* Tower Building, in Chicago, and he also designed and built the American Radiator Building in New York. Mr. Saarinen is a native of Finland and one of the leading architects of Europe, having specialized in city planning and municipal enterprises. Mr. Saarinen has served on several international juries, including the architectural competition at the Olympiad in 1924; on the competition for a Parliament House at Canberra, Australia; and as a member of the City Planning Competition at Bergen, Norway. He is Vice-president of the International City Planning Conferences and a member of many architectural associations.

The members of the jury were selected by the more than 1,900 architects in all the nations of the world who registered for the competition which is being conducted by the Pan American Union according to the terms of a resolution adopted at the Fifth Pan American Conference. The Lighthouse will be erected on the coast of the Dominican Republic, the scene of the first permanent settlement in America, and will commemorate in an appropriate manner the discovery of the New World by Columbus.

THE GEORGE G. BOOTH TRAVELING FELLOWSHIP

THE George G. Booth Traveling Fellowship in Architecture at the University of Michigan has been awarded to Frederick J. B. Sevald (1929), of Detroit. The second place was awarded to Jonathan A. Taylor (1929), of Ann Arbor; honorable mention to Livingstone H. Elder (1928), Billings, Mont. There were 12 competitors. The problem this year was "A Municipal Boat House," involving, in addition to facilities for boats, a ball room, lounge, refreshment and service rooms, a roof garden and lookout. Only 11 days were allowed for the competition, the students preparing drawings without criticism.

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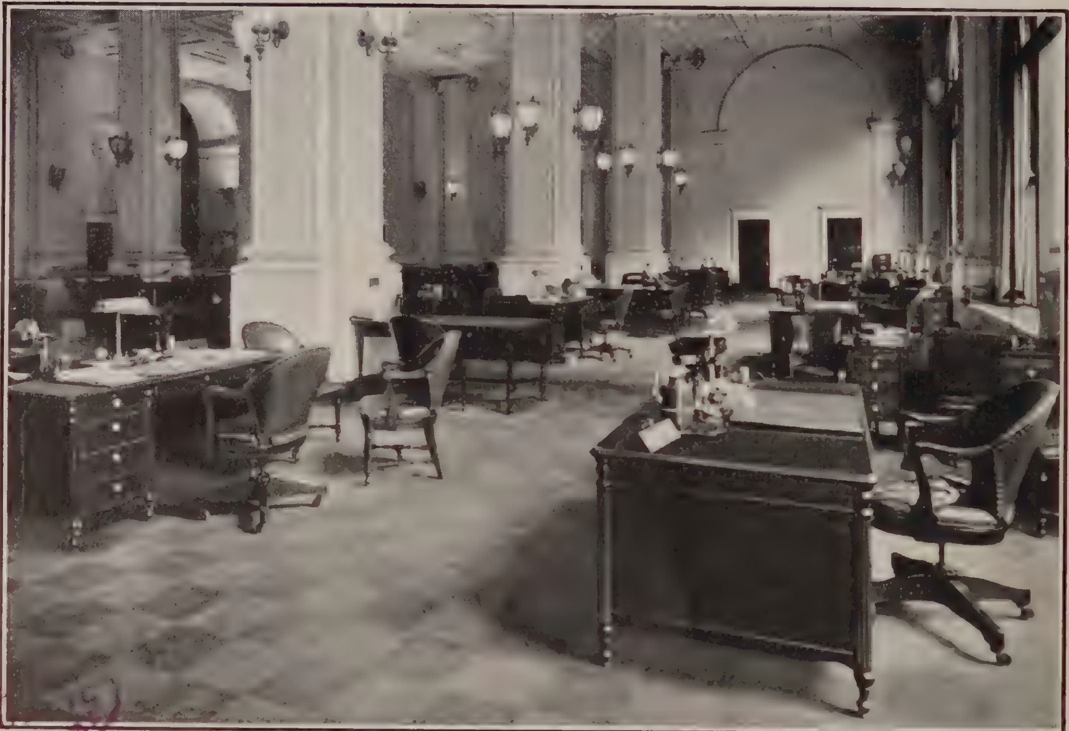

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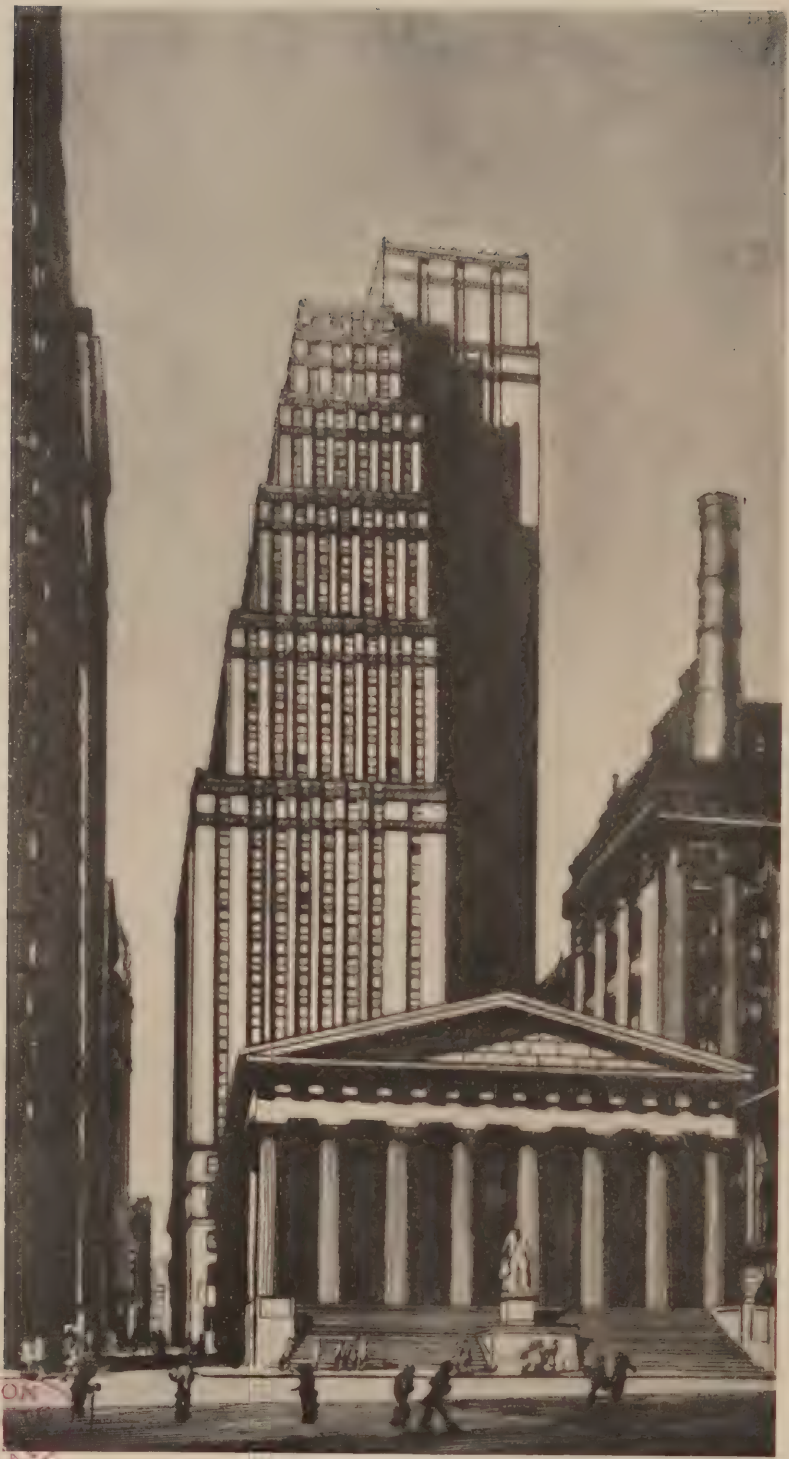

OSTON
PUB
LIBRA

CHASE NATIONAL BANK BUILDING, NEW YORK

GRAHAM, ANDERSON, PROBST & WHITE, ARCHITECTS

From an Etching by Peter Marcus

THE
ARCHITECTURAL
FORUM

VOLUME LI

NUMBER ONE

JULY 1929

THE CHASE NATIONAL BANK BUILDING, NEW YORK

BY

ALFRED SHAW

THE Chase National Bank Building, recently completed in New York, fulfills every essential requirement of the modern American commercial problem. It was erected at the foot of Manhattan Island, which has produced the amazing pile of steel and stone that symbolizes America to most Europeans. It was restricted by the new zoning laws of New York; planned on an irregular L-shaped piece of property, in which there was but one square corner, every square inch of which was needed for use by the owner. It was studied as to its economic possibilities during the period of real estate negotiations; and it was erected under the terrific pressure of mounting interest rates and demands for space and use. The engineering difficulties involved the problem of excavating to bed rock on the very toes of ponderous buildings, and of building foundations and basement floors while the bracing necessary to hold adjacent walls was still in place. It was also necessary to make every part of the building easily accessible by elevators, well warmed in winter, well ventilated in summer, and well lighted both by daylight and by electricity. The telephone exchange, large enough to make it possible for any person at any point in the building to talk with any part of the United States and some parts of Europe, is as large as the exchange in Hartford.

The venerable tradition and the present dignity of the Chase National Bank demanded an exterior design of fine architectural character. The officers of the bank as well as the architects realized the significance of creating a building which would not only be expressive of this dignity, but also individual and highly indicative of the new American architecture. As the studies progressed, the pyramidal mass suggested some of the characteristics of the architecture of Egypt, and in this direction the architectural scheme developed. Both the exterior and the interior have been designed with a feeling for the simplicity of Egyptian detail, and the color which is used in the more important rooms was selected from the same source. The five and one half stories below the street level contain the safe deposit department, the currency departments, and the great vaults which run through three stories, resting on the rock 85 feet below the street. On the first floor are the main banking room and the loan and discount department, which extend through two stories. On the third floor is the credit department, and on the fourth floor are the offices of the chairman of the board, the president, and the chief executives, as well as an extremely interesting board room which is in the form of half an ellipse.

The trust department occupies the fifth and sixth floors, the Chase Securities Corporation the eighth and ninth floors, and the working forces of the bank occupy space extending through seven stories to the 13th floor, from which point up the building is occupied by offices of a general commercial nature. At the very top of the building, on the floors which give magnificent glimpses across and over Manhattan and its rivers and environs, are the club rooms and dining rooms of the executive and junior officers of the bank. The building was first considered in November, 1926, and the property was purchased then; drawings were made; engineering difficulties and architectural problems were solved; plans for workings of the bank down to its most humble employe were completed; contracts were let, furnishings purchased, and the bank was occupied on August 28, 1928. This was due to the realization of all concerned of the extent of the task before them and the whole hearted coöperation of the officers of the bank, the chairman of the building committee, and the entire organization, with the architects and the engineers. Great enterprises of this sort require the thought, enthusiasm and determined courage of many people. Into this structure have been built the ardor and spirit of all of them.

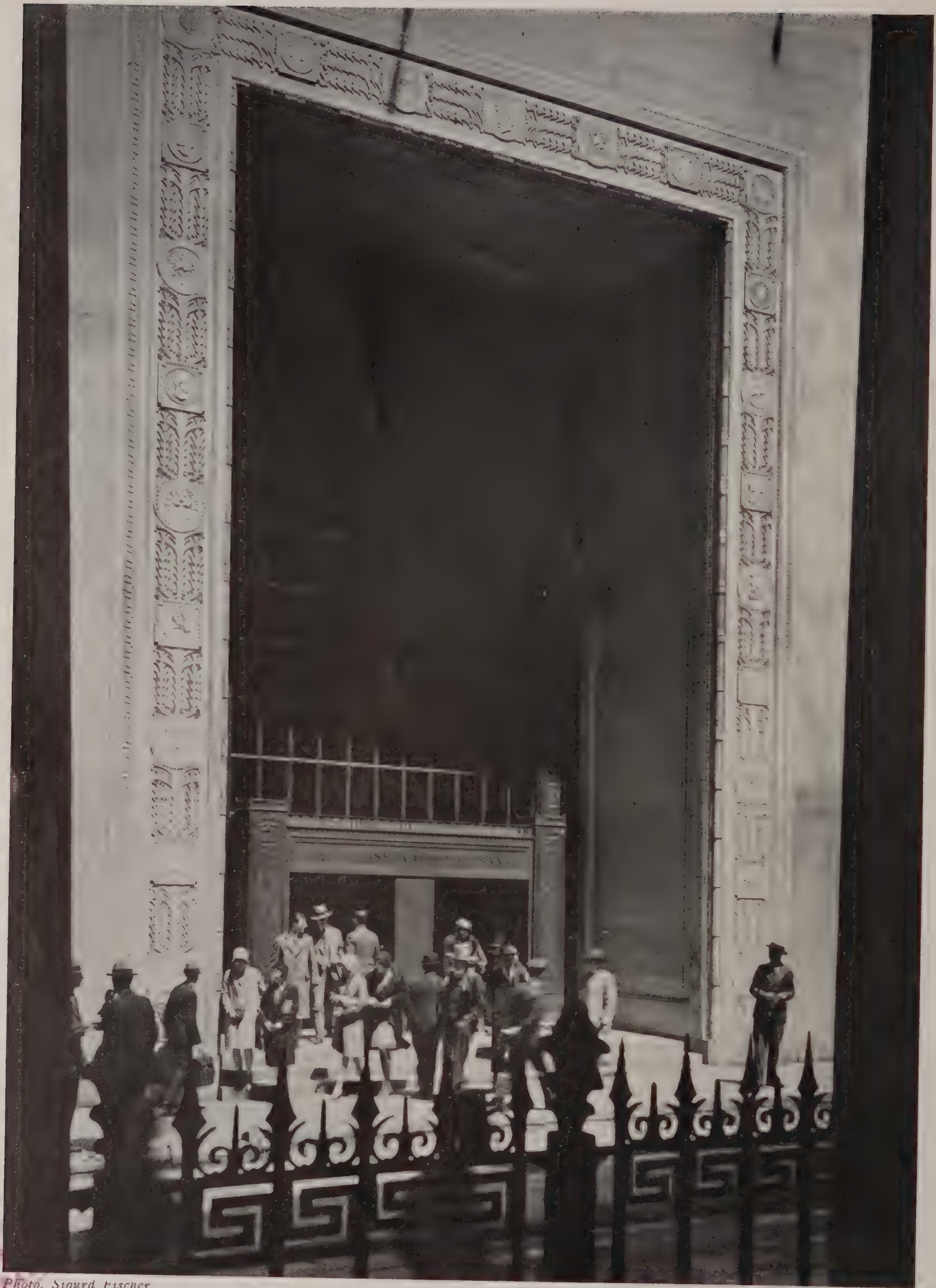

Photo. Sigurd Fischer

MAIN ENTRANCE ON PINE STREET
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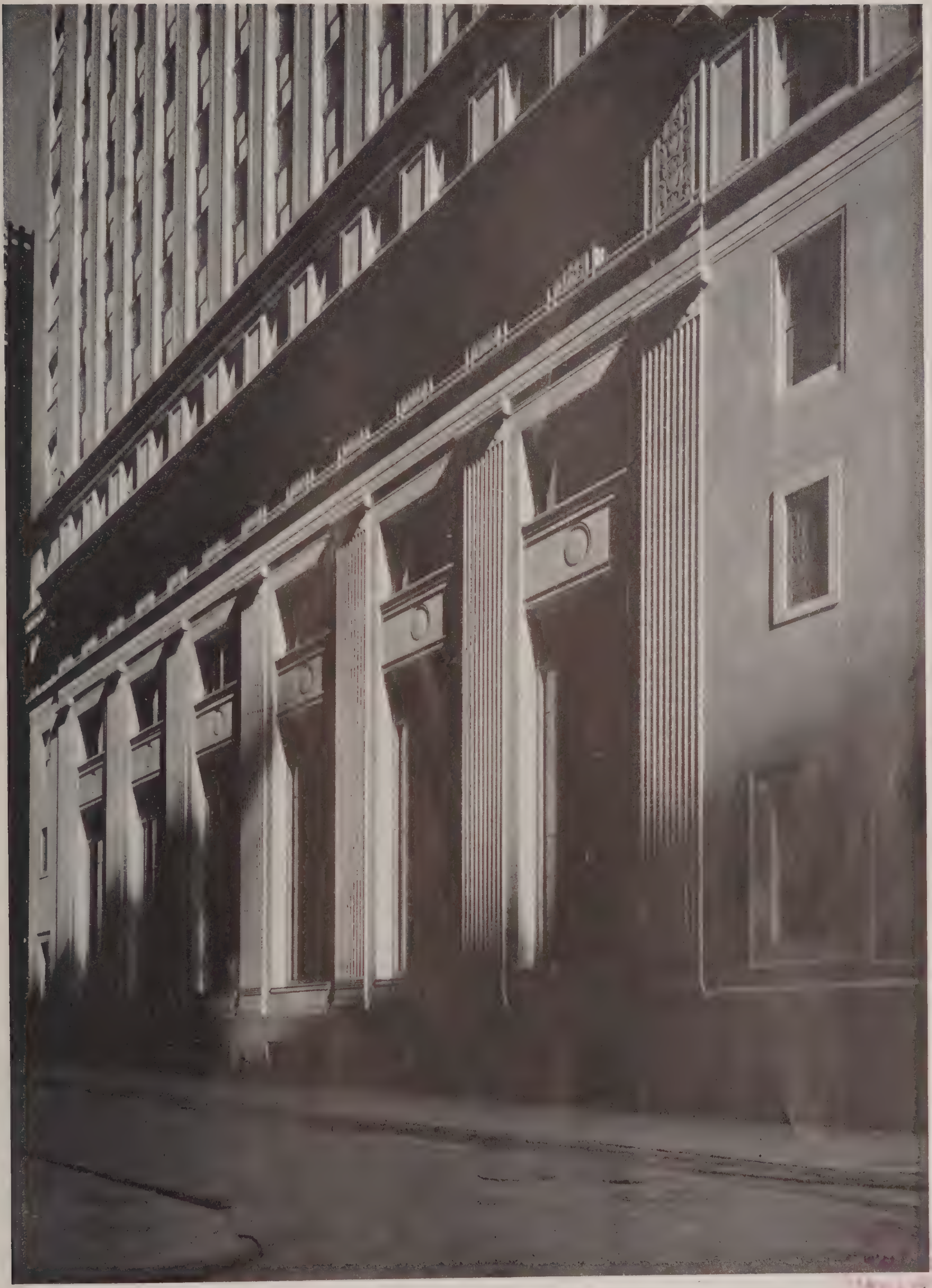

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NASSAU STREET ELEVATION
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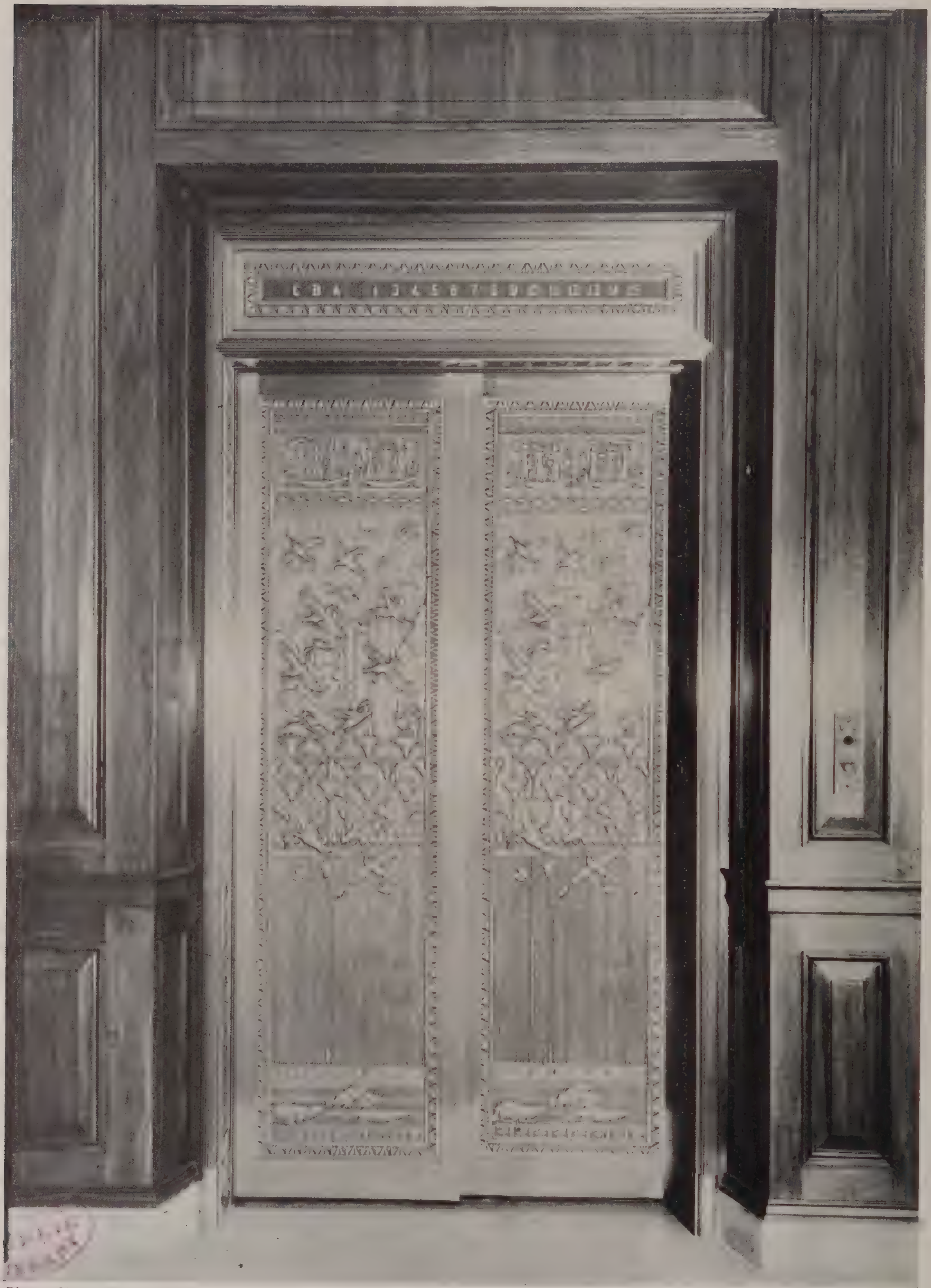

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AN ELEVATOR DOOR
CHASE NATIONAL BANK BUILDING, NEW YORK
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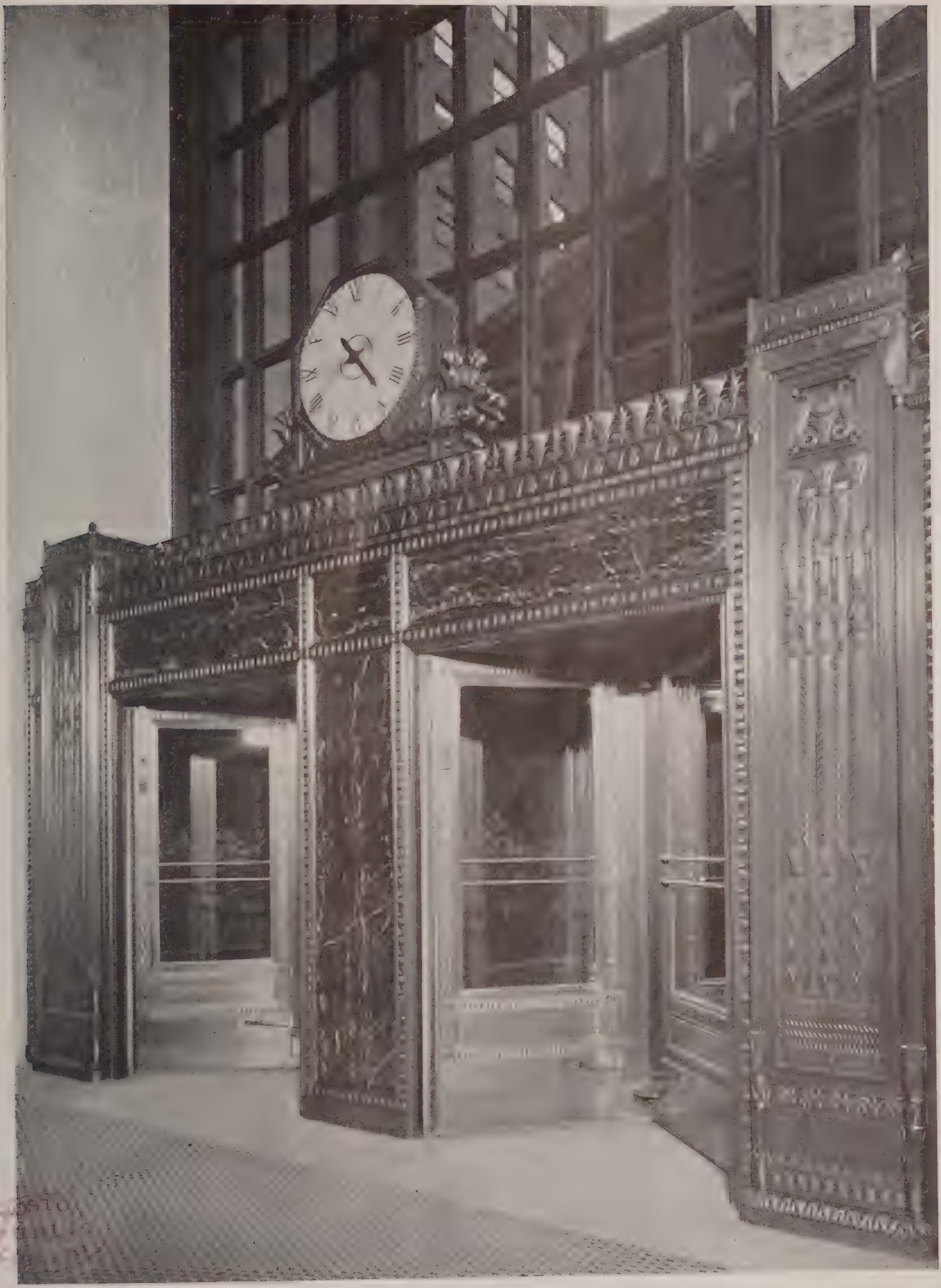

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INTERIOR OF ENTRANCE DOORS
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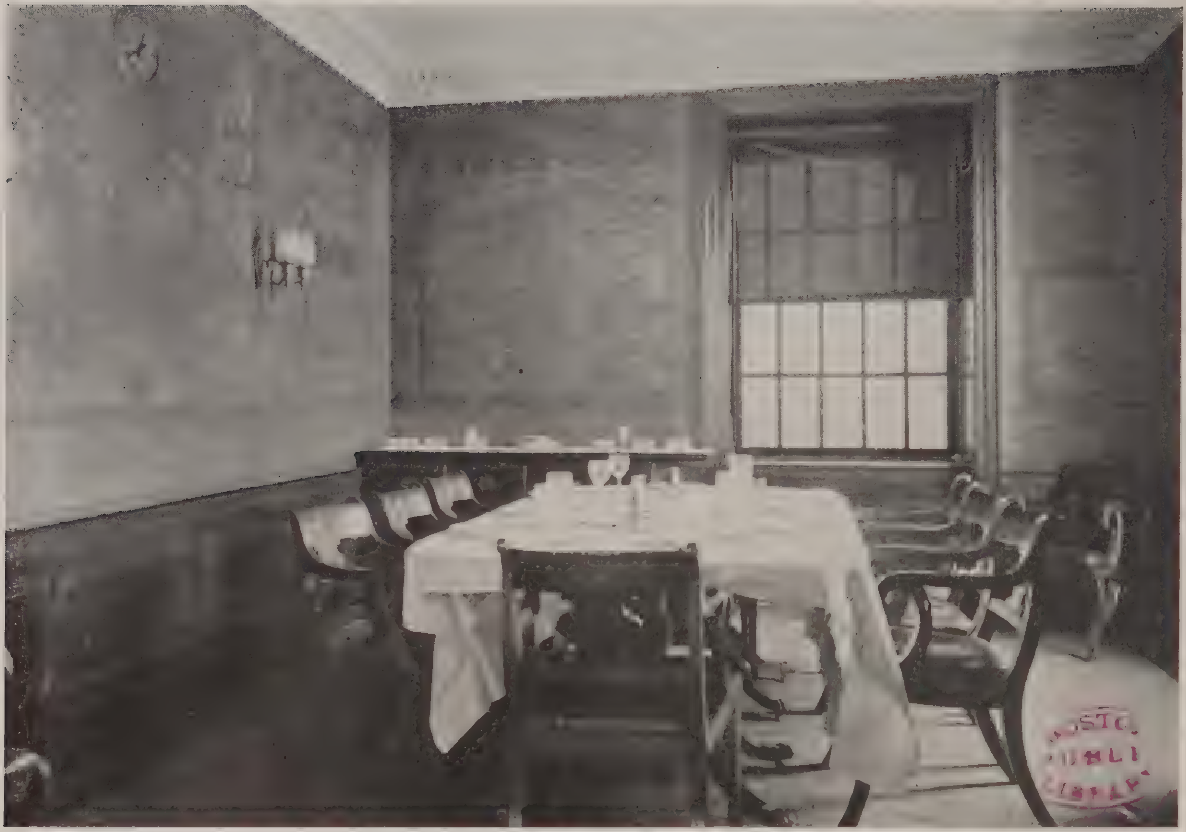


A Dining Room. Chase National Bank Building, New York
Graham, Anderson, Probst & White, Architects

AN APPRECIATION

BY

MATLACK PRICE

FOR all that the attention of New York's island citizens is momentarily focused on the intensive building of great towers in the midtown region, towers of finance and commerce continue to rise shoulder to shoulder in the downtown section. About these acres of the island's lower end a great volume should be written, which might be an architectural book or might be an epic poem in blank verse. "Laid out by Euclid, built by Titans, furnished by Edison" someone wrote 25 years ago. Much has happened since, among other things the set-back requirement in designing tall buildings, first seen as a restriction, but now as an opportunity, and as the point of departure of an entirely new vision of architecture.

One of the newest additions to the now almost solid phalanx of great buildings in lower New York is the Chase National Bank, rising 38 stories to a height of 478 feet behind the old Sub-treasury Building,—classic relic of another age. This is an old Doric temple, symbol of everything that once epitomized architecture. It is still a symbol, but architecture has mounted skyward since the Sub-treasury was built, and has become at once more complex and more simple,—more complex in its aims, requirements and accomplishments; more simple in its means of providing modern, efficient, urbane housing for vast and intricately ramified organizations such as the Chase National Bank, which is one of this country's greatest banking organizations. The site of the new Chase National Bank Building was not, architecturally, easy to deal with, but it would have presented a much more difficult problem to the architect of 20 years ago than it presented to the architect of today. There is frontage on Nassau and Pine Streets, with a narrow L giving a frontage and entrance on Cedar Street, and only one square corner in the whole plan. In the architecture of yesterday, an architecture having to do mainly with facades, this would have been a desperately unhandy site. Under the terms of our architecture of today, which has to do mainly with masses, the matter finds a more natural solution. A building now can be piled up with all the rugged informality of a natural rock formation. Its diminishing masses may be set at angles oblique with the substructure,—which would have played havoc with a formal or conventional facade.

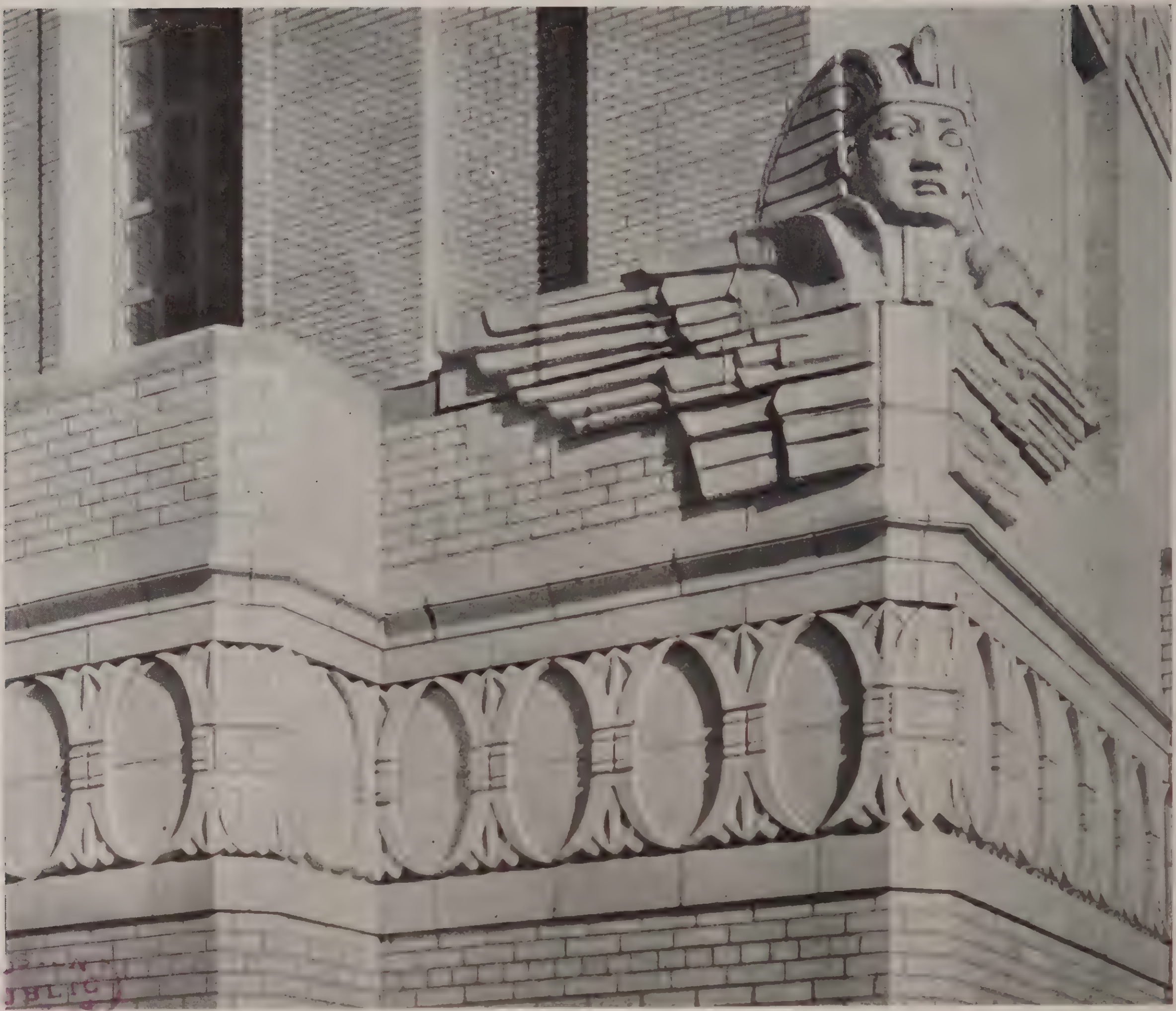
With the essential masses of his building determined, the modern architect has now only to concern himself with a manner of treatment, and this, it has been found, is best when it is simplest, and when it abandons, largely, the old "stock" architectural embellishments that have, after years of faithful service, earned a rest in quiet retirement. As was said in these pages last month about the Chanin Building, architects have wisely come to the conclusion that the copings of the great massive shoulders of the new buildings are not good places to set little urns and obelisks. So strong was the habit of using detail for detail's sake that it was first believed that set-backs needed some kind of extraneous embellishment in order not to look bleak or "unfinished." Fortunately, the immutable laws of scale asserted themselves, and demonstrated that no embellishment of set-backs can be trivial or unrelated, and that if any detailed treatment of the great masses is to be attempted, it must be of such heroic mould as that on the New York Telephone Building, the Shelton Hotel or the Chanin tower. Thus, on the corners of the parapet of the first set-back on the Chase National Bank Building, there is a great winged sphinx head, with the wings modeled into the coping, and in lesser set-backs above this these are repeated, an interesting motif, and one in conformity with the Egyptian detail used elsewhere.

The main entrance is on Pine Street, a monumental portal to the bank proper and a less architectural entrance for the office tenants. The whole design of the main entrance is unusually interesting,—an elaborate Egyptian design in finely wrought bronze set in a frame of pink Tennessee marble carved with close adaptations of 22 historical coins and an American dollar. These have afforded a decorative motif that is more than symbolical; it is a highly appropriate decoration for a bank entrance, and a reminder that the bank houses the Chase Bank Collection of the Moneys of the World, the famous collection started in 1882 by Farran Zerbe, who is now its curator. The collection is believed to include the greatest number of varieties of exchange media ever collectively displayed, and from this wealth of material many coins were chosen as bas-relief decorations for the enframement of the bank's entrance. Beginning at bottom, left: Roman *sestertius*, *stater* of Metapontum, early Greek coin of Poseidonia, Spartan coin of Tarentum, the Hebrew *shekel*, the *aureus* of Augustus, sixteenth century Dutch coin, *testone* of the Italian Renaissance, colonial Pine Tree shilling, *testone* of Francis I, Spanish milled dollar, the American Peace Dollar, the Joachimthaler, Elizabethan gold pound, New York cent, Japanese *yen*, Russian two-*kopeck* piece, the *florin*, Ptolemaic coin, early Greek *tetradrachm* of Alexander the Great, *stater* of Corinth, *decadrachm* of Syracuse. The coins represented were selected with the help of the American Numismatic Society, and from plaster casts the enlargements for the marble cutter were made by the sculptor, M. H. Kock, who also modeled most of the Egyptian detail.

This portal of historic coins opens to a landing from which a few steps lead up to the mezzanine floor and down to the banking space, where the tellers are found. The great mezzanine office floor consists mainly of one large room, with private offices in alcoves. The walls, unelaborated, are of Roman travertine, and the ceiling is of dull gold and polychrome, in Egyptian motifs. The whole effect is that of quiet restfulness and dignity,—a perfect environment for the transaction of important business. The bank occupies 13 floors of the building, with a reservation covering five more, and in basements and sub-basements there are vaults as far down as five stories below grade. From the banking space and mezzanine, elevators serve the bank exclusively, while other elevators, local and express, are found in the public lobby that serves the building as a whole.

Architecturally, the most interesting of the bank's floors above the main floor is the fourth, where are located the reception room, directors' room, law library, and offices of the senior executives. The whole atmosphere here is that of dignified repose,—walnut paneling, carpeted floors, the feeling of a distinguished club as opposed to a commercial office environment. Portraits of the principal officers are framed architecturally in simple mouldings that match the woodwork, instead of in heavy gold. A generation ago these interiors would have been pompous and ornate, heavy with grandiose impressiveness; here they are gracious, quietly well bred, admirably expressive of the essential spirit of the organization. The directors' room is patterned very closely after the room of the Supreme Court in Washington. A Georgian ceiling, fan-ribbed in the Adam manner, pilasters of a specially sought green marble, and a great semi-circular table, following the semi-circular shape of the room, with the chairman's seat at the center of the straight wall. A room that is serious without being solemn and suggesting efficiency without ignoring graciousness.

Far above this floor,—on the 33rd and 34th floors,—are dining rooms, with a fully equipped kitchen on the 35th. On the 34th floor are officers' dining rooms, several private dining rooms and a lounge, with furniture not too particularly stylized,—American Chippendale, perhaps, commendably simple, and old with even more of the atmosphere of the most distinguished sort of club than the fourth floor. On the 33rd floor are other



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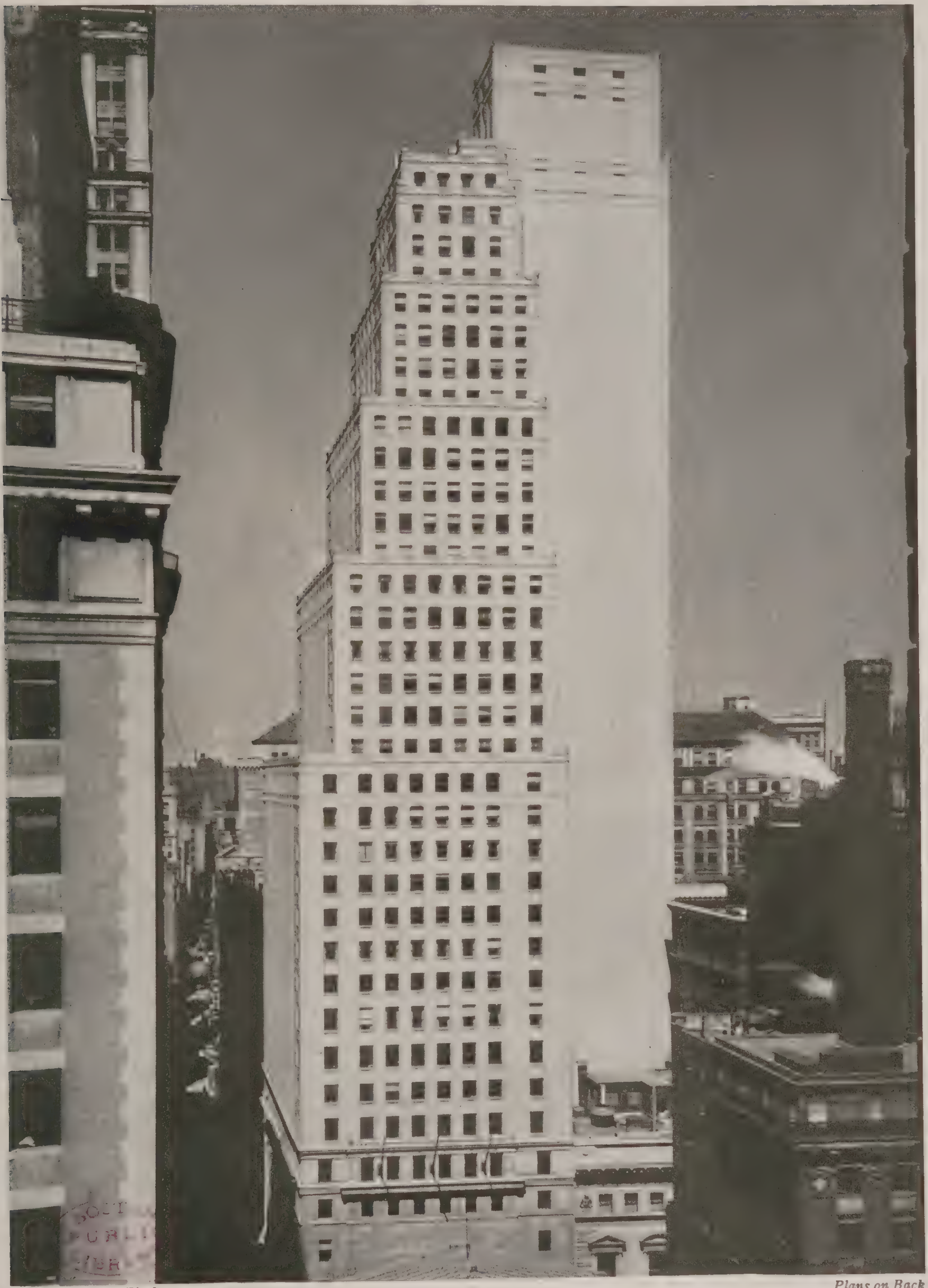
Corner Detail. Chase National Bank Building, New York
Graham, Anderson, Probst & White, Architects

officers' dining rooms, the larger room pleasantly chintz-curtained, and here, too, is a private dining room in oak, and another entirely papered with old maps, antiquely mellowed with shellac.

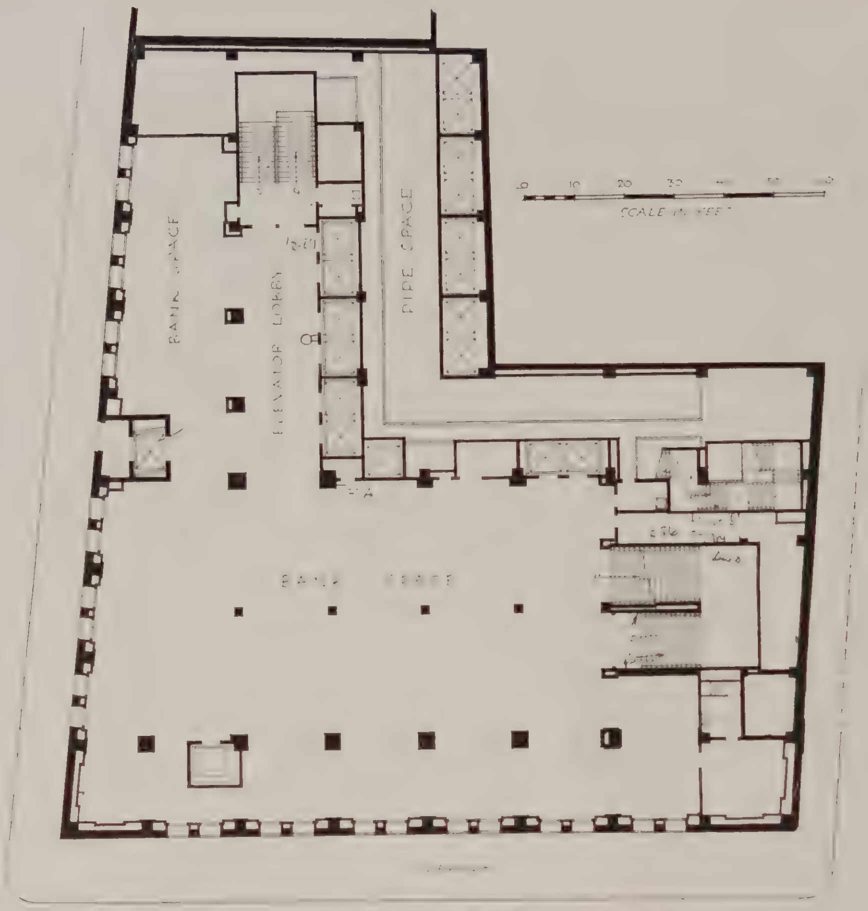
In this kind of a building there are architectural qualities more or less pictorial,—incidents, details, interiors that lend themselves to description, and there are other qualities, no less architectural and far more important, that cannot well be visualized. Here is an organization of 3,000 people in this one building, engaged in work so important and exacting that much of it must be pursued on a 24-hour daily basis. When a bank clears daily checks aggregating at times $250,000,000, efficiency needs to be more than the mere catchword of some office martinet. It must be a very real thing, and in the planning of this structure the architects worked in close coöperation with certain of the bank's officials, three vice-presidents—Messrs. Reeve Schley, James T. Lee, and William H. Moorhead. With the architects these men planned those essentials of the practical relationships of the different working departments, not only as of today, but with a view to inevitable future growth. There could be no lost motion in the contacts of one department with another, in the location of files and records. The problem departed from architecture, academically considered, and demanded that architecture make an intensive and practical study of bank management in all its varied phases and requirements. Both architects and bankers needed one another's most intelligent and expert coöperation, and to this partnership the Chase National Bank Building stands as a significant monument. The architects and bankers must feel a joint as well as an individual pride of achievement,—a sense that together they have created an intricately articulated whole,—a modern building designed for a modern bank. The structure as it stands adds a new note to New York's financial district, and striking as showing the change to the new from the old is the structure of the Chase Building beyond the Doric porticoes of the old Sub-treasury.



Photos. Sigurd Fischer

Plans on Back

CHASE NATIONAL BANK BUILDING, NEW YORK
GRAHAM, ANDERSON, PROBST & WHITE, ARCHITECTS



GROUND FLOOR

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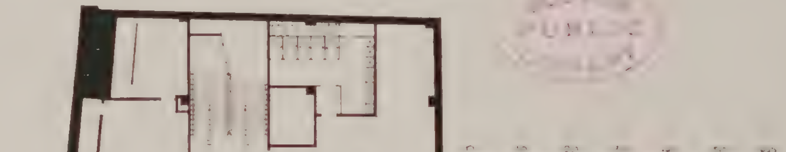
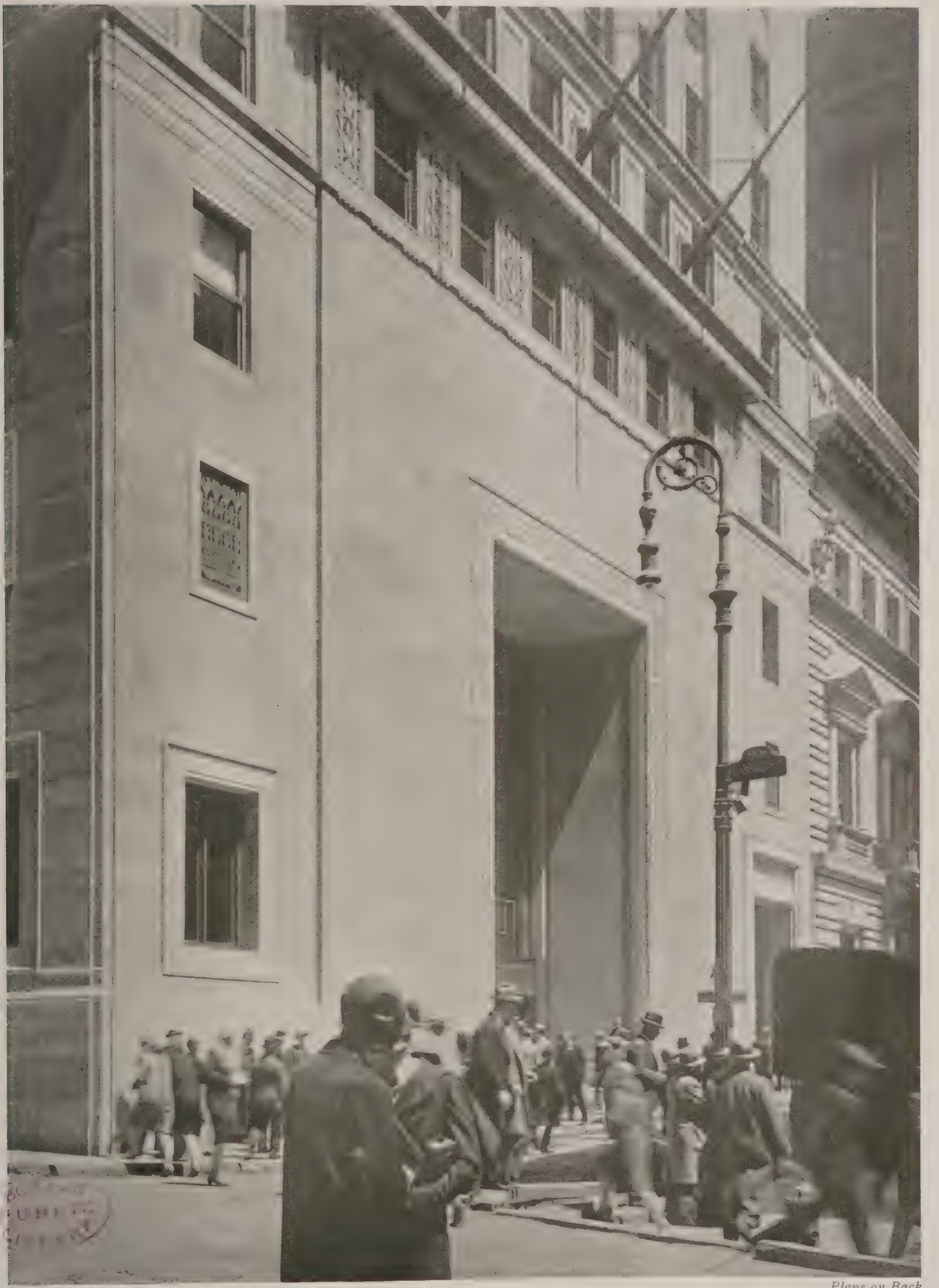


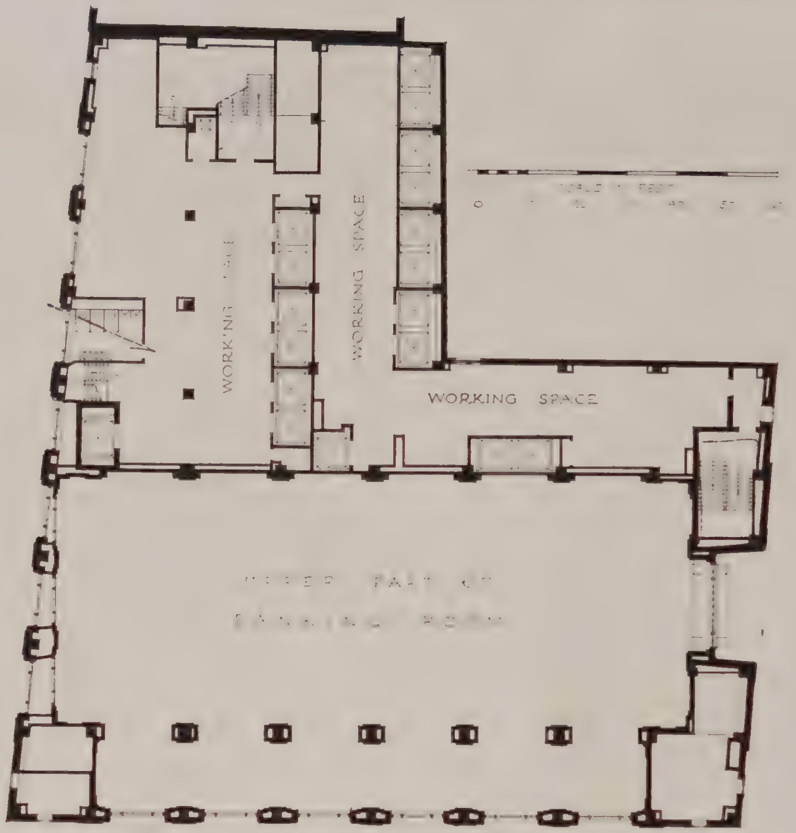
BASEMENT "A"

PLANS. CHASE NATIONAL BANK BUILDING, NEW YORK
GRAHAM, ANDERSON, PROBST & WHITE, ARCHITECTS



Plans on Back

ENTRANCE ON PINE STREET
CHASE NATIONAL BANK BUILDING, NEW YORK
GRAHAM, ANDERSON, PROBST & WHITE, ARCHITECTS



FIRST FLOOR MEZZANINE

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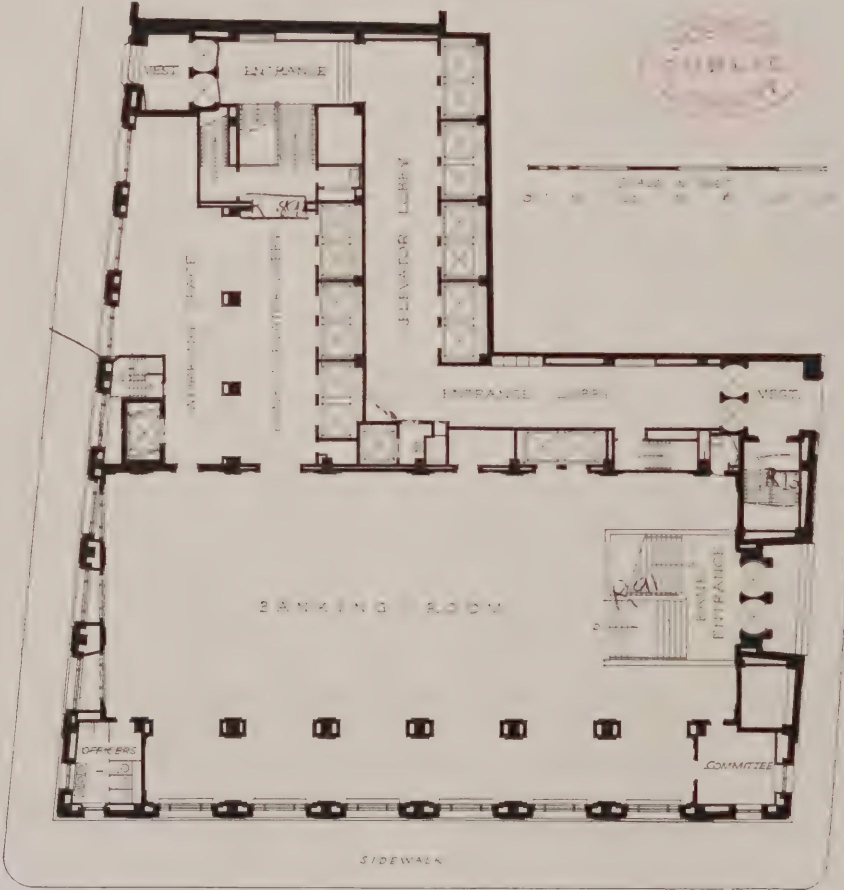
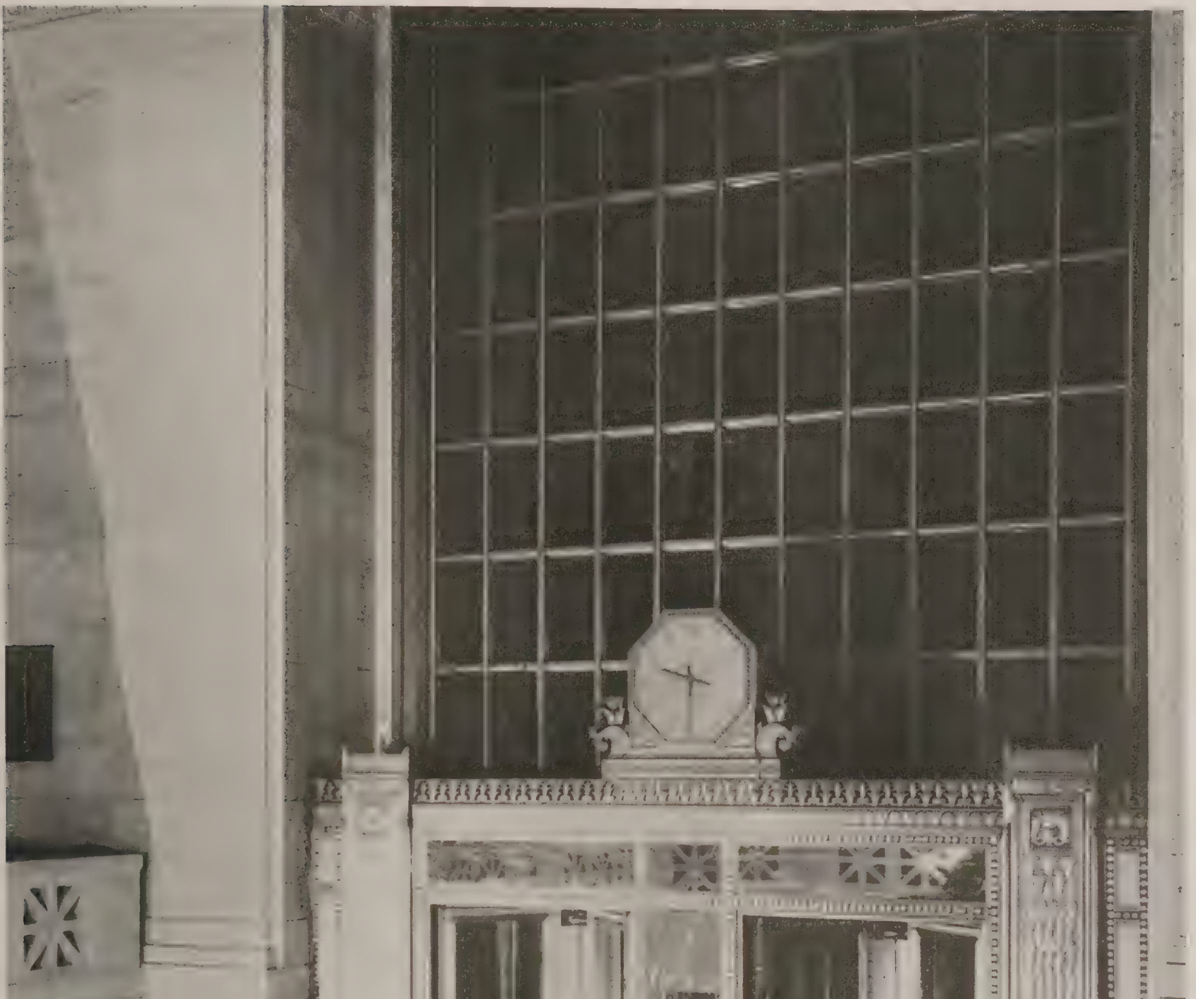


FIRST FLOOR

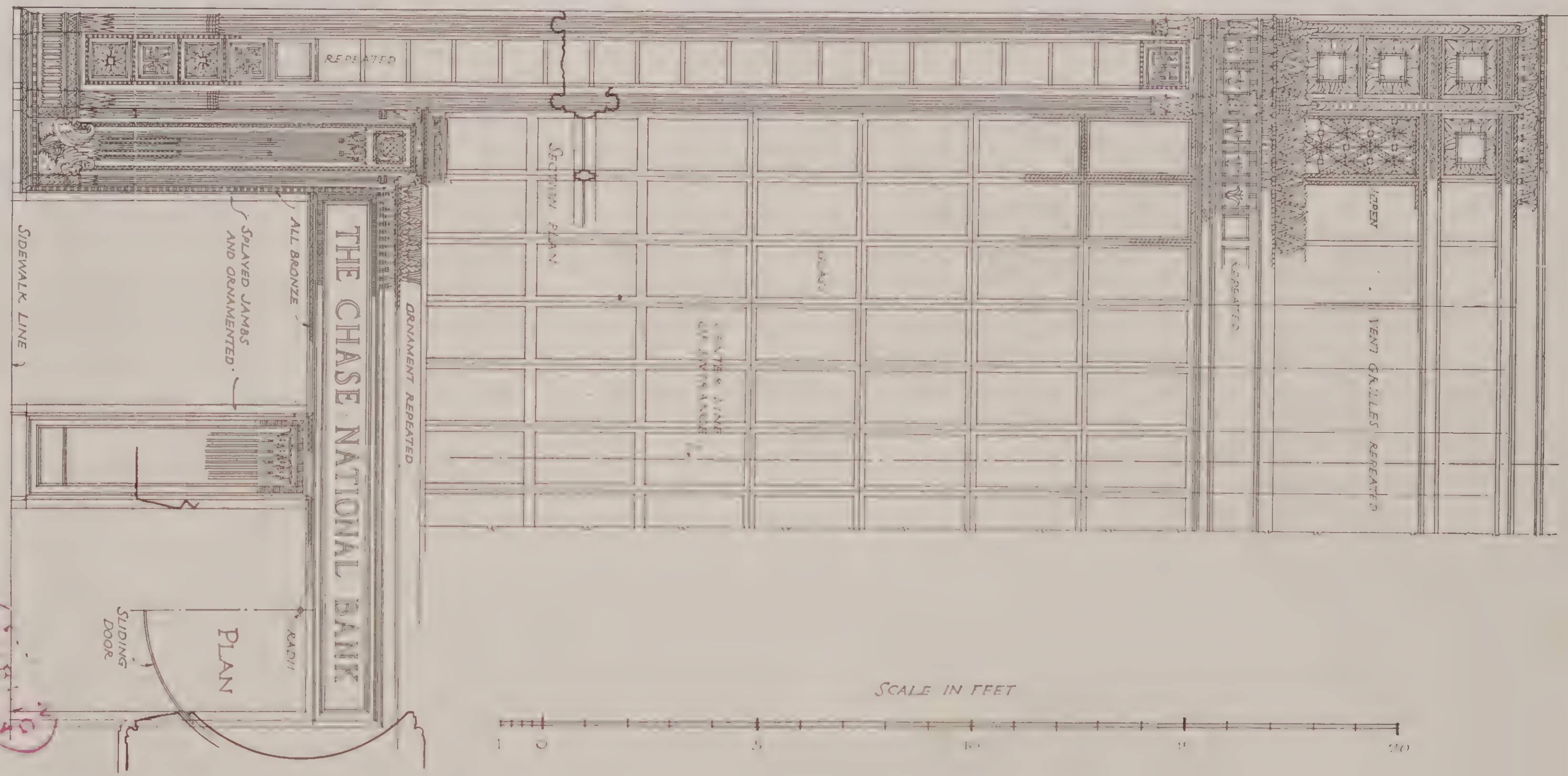
PLANS: CHASE NATIONAL BANK BUILDING, NEW YORK

GRAHAM, ANDERSON, PROBST & WHITE, ARCHITECTS



Details on Back

MAIN ENTRANCE TO BANKING ROOM
CHASE NATIONAL BANK BUILDING, NEW YORK
GRAHAM, ANDERSON, PROBST & WHITE, ARCHITECTS



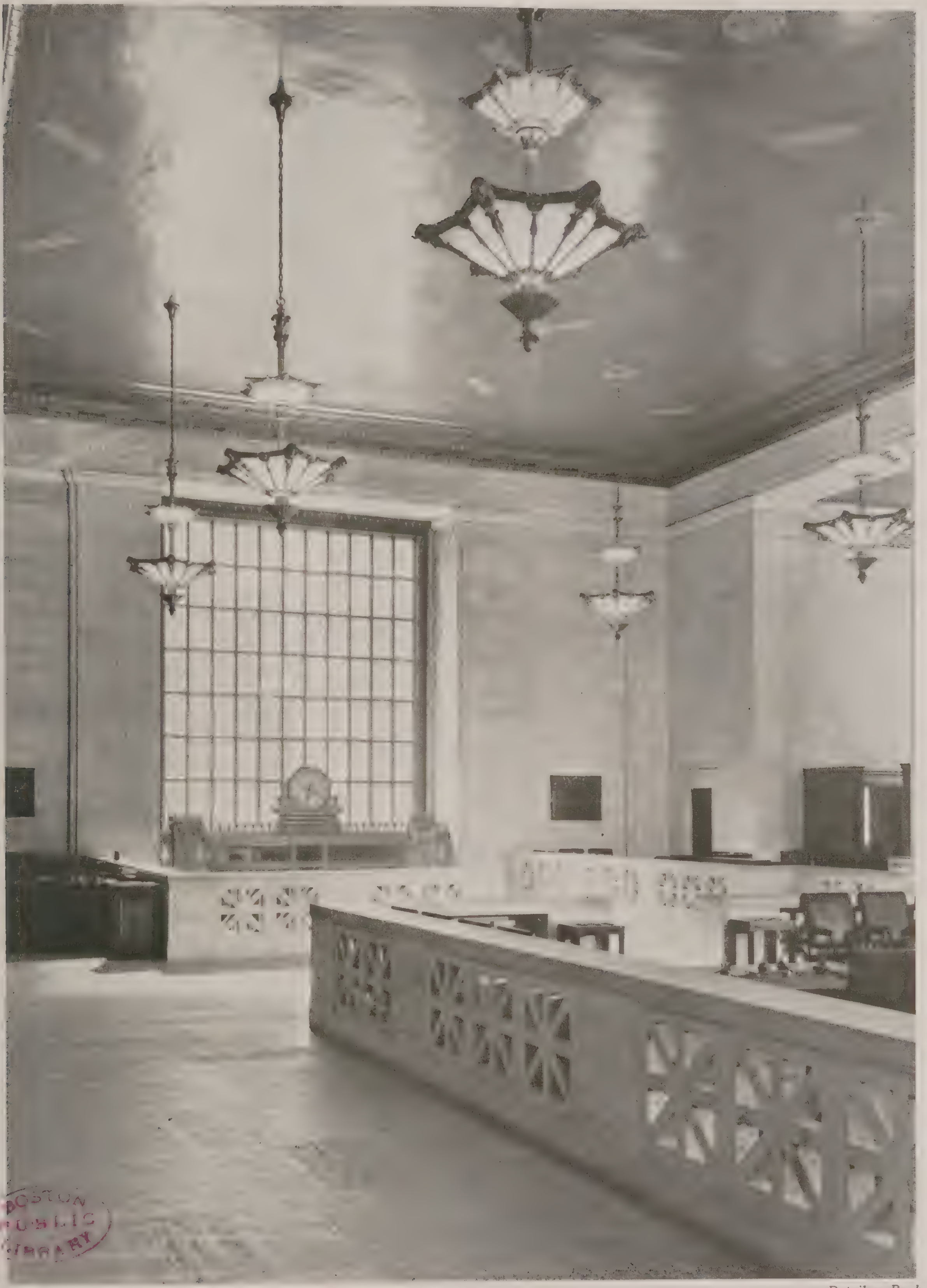
ENTRANCE DETAIL

CHASE NATIONAL BANK
NEW YORK CITY

JULY 1929

No. 1

The ARCHITECTURAL FORUM DETAILS



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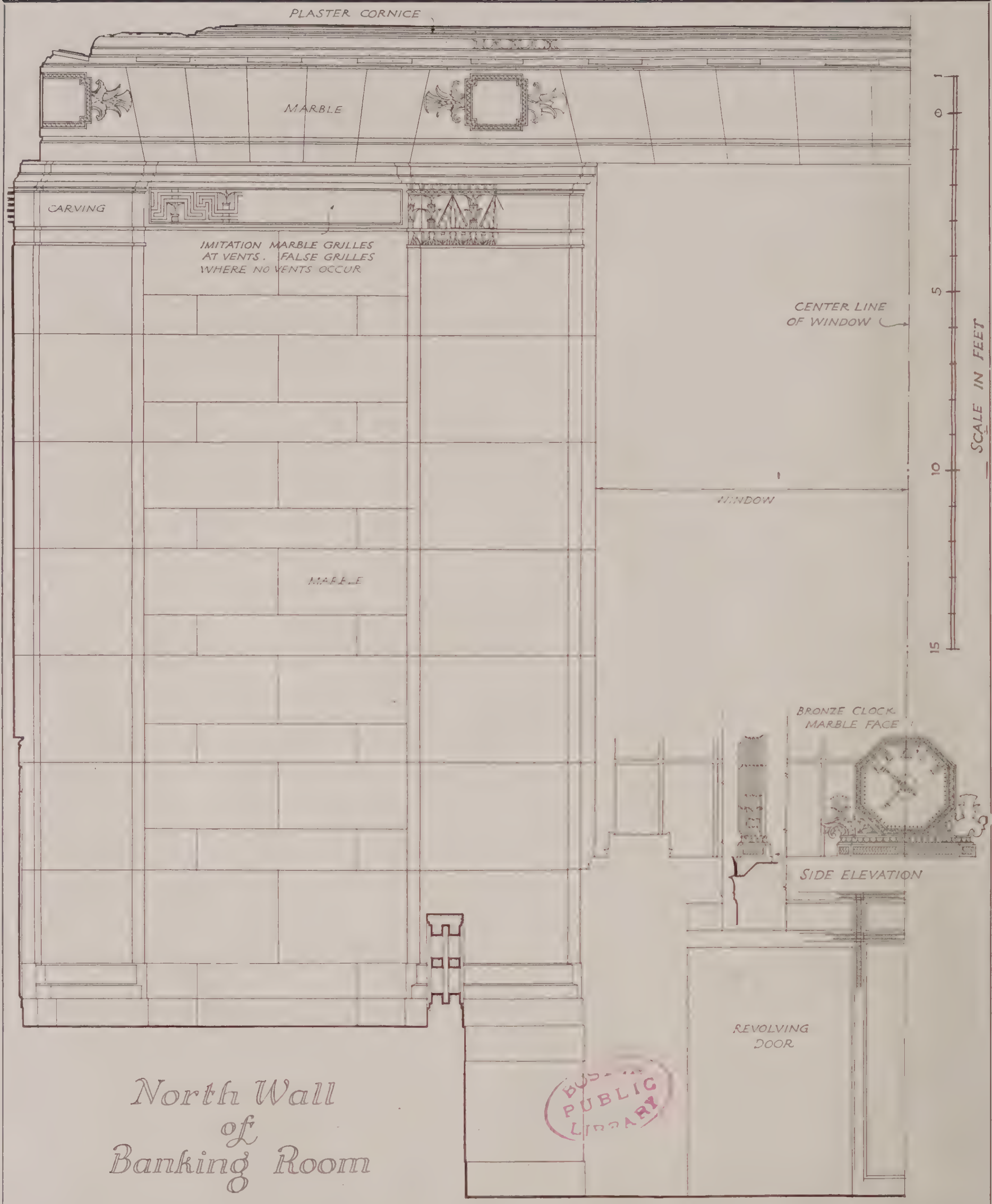
Detail on Back

MAIN BANKING ROOM
CHASE NATIONAL BANK BUILDING, NEW YORK
GRAHAM, ANDERSON, PROBST & WHITE, ARCHITECTS



North Wall of Banking Room

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DETAIL. CHASE NATIONAL BANK BUILDING, NEW YORK
GRAHAM, ANDERSON, PROBST & WHITE, ARCHITECTS

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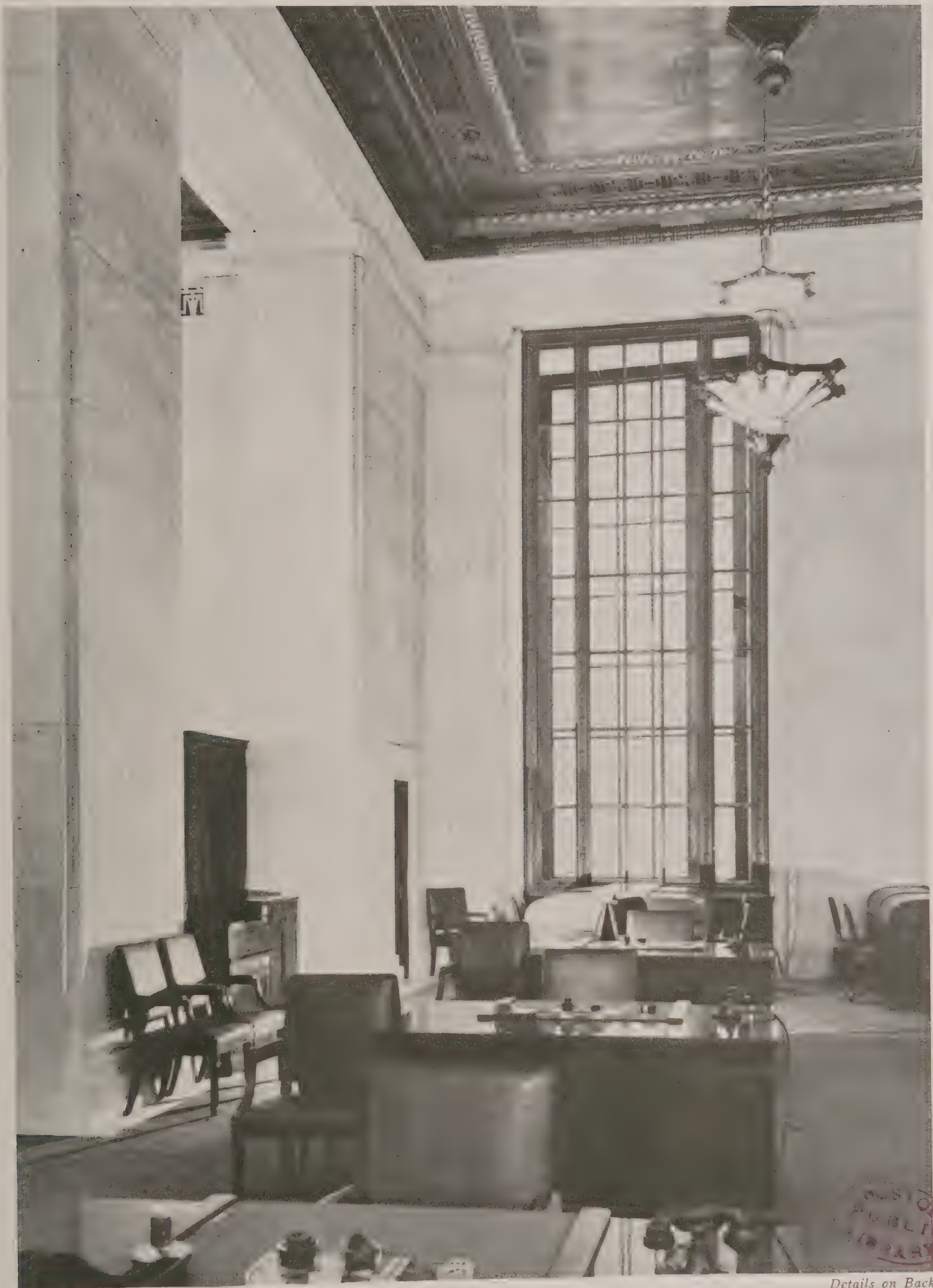
The ARCHITECTURAL FORUM DETAILS



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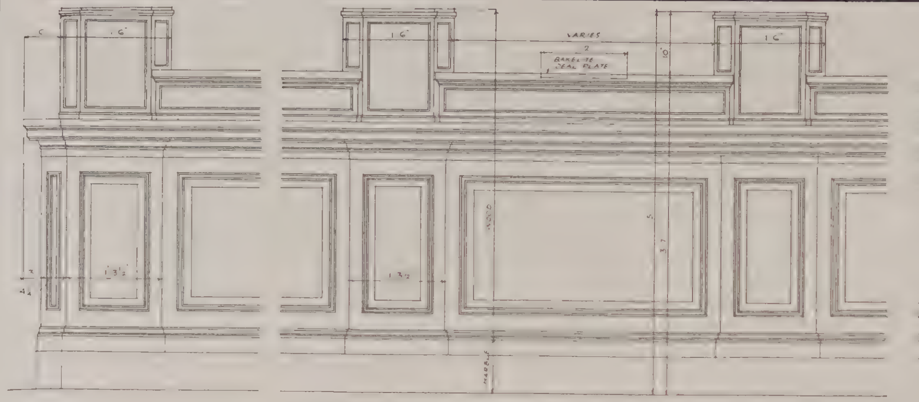
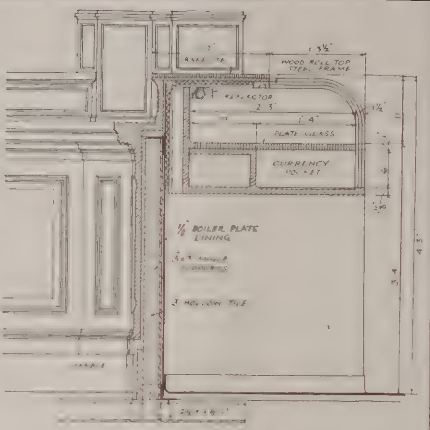
Details on Back

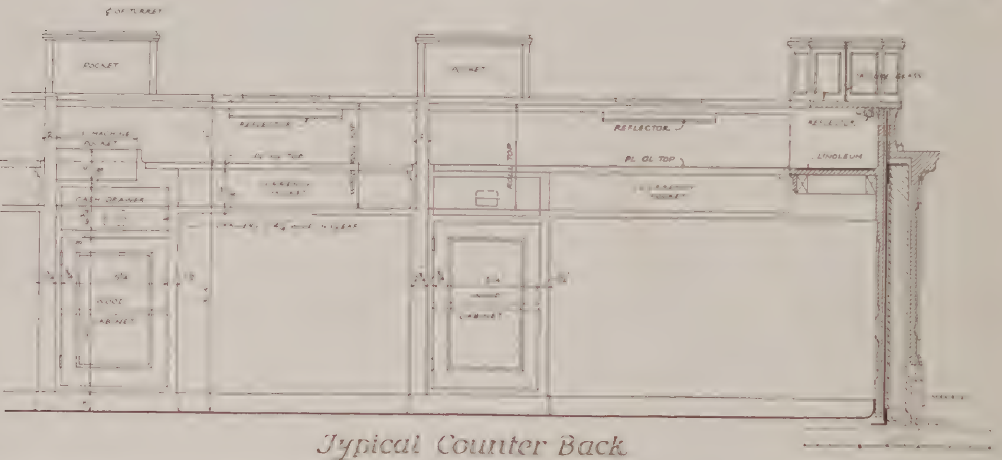
MAIN BANKING ROOM
CHASE NATIONAL BANK BUILDING, NEW YORK
GRAHAM, ANDERSON, PROBST & WHITE, ARCHITECTS



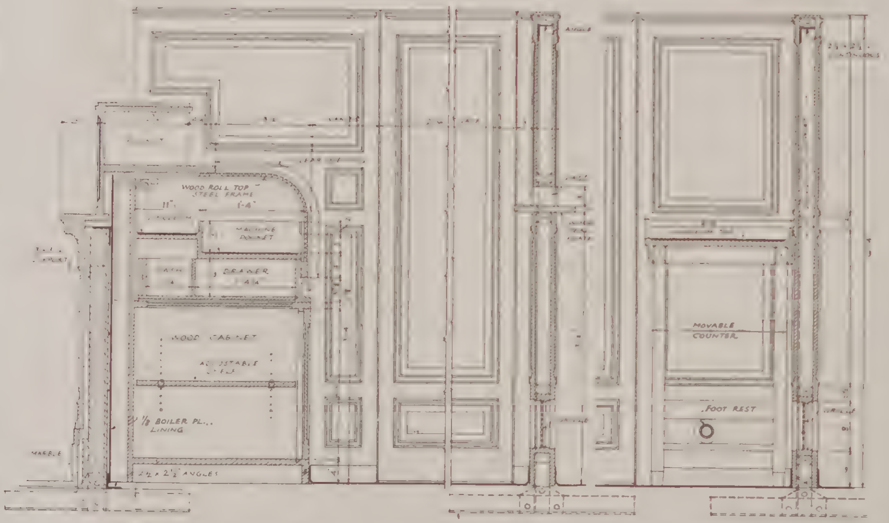
Typical Counter Front



Typical Section



Typical Counter Back



Typical Section Rear Screen Rear Counter

TYPICAL COUNTER SCREEN DETAILS

THE CHASE NATIONAL BANK BUILDING
NEW YORK CITY

JULY
1929

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SCALE IN FEET

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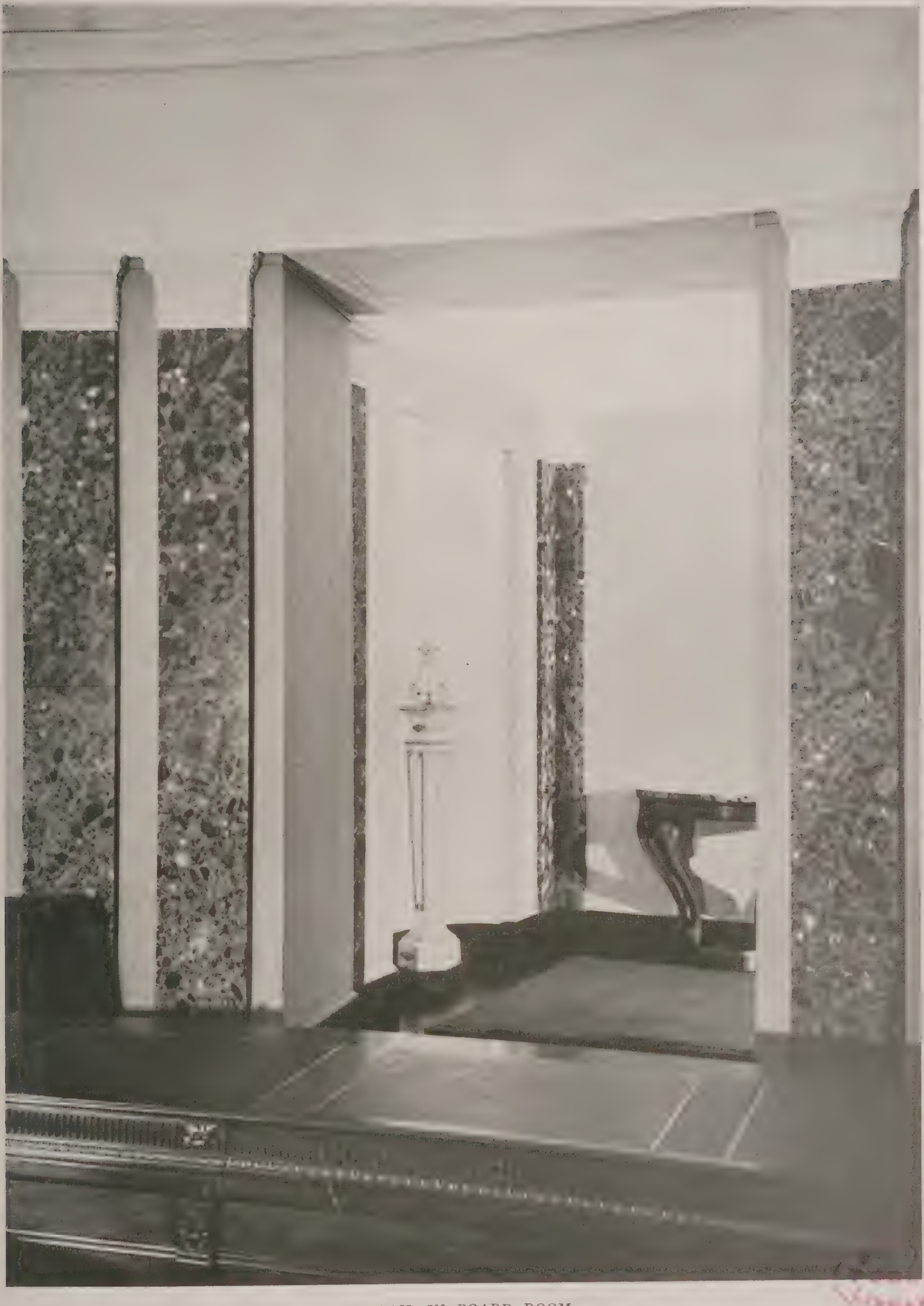
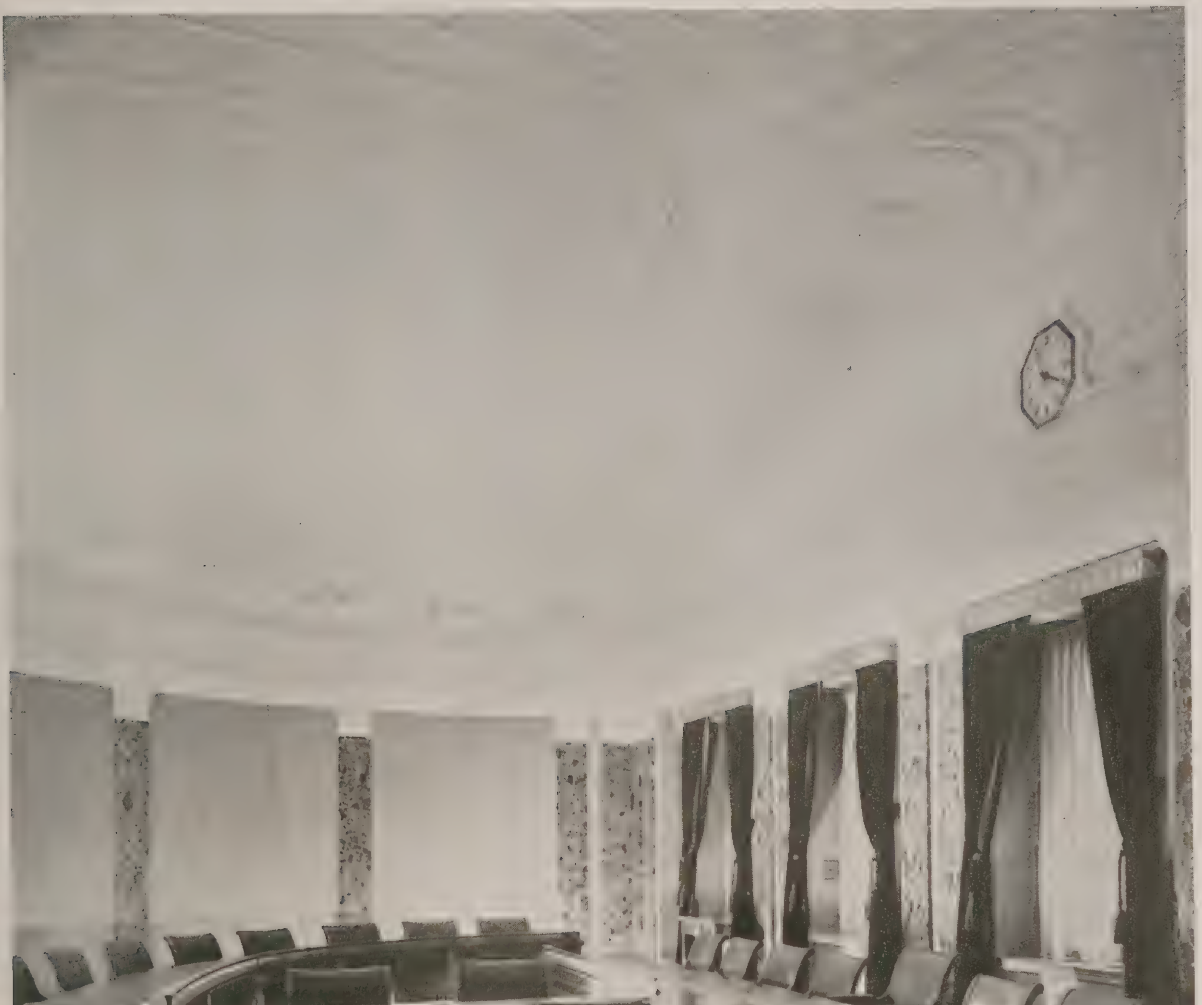
The ARCHITECTURAL FORUM DETAILS



DETAIL IN BOARD ROOM
CHASE NATIONAL BANK BUILDING, NEW YORK
GRAHAM, ANDERSON, PROBST & WHITE, ARCHITECTS



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BOARD ROOM
CHASE NATIONAL BANK BUILDING, NEW YORK
GRAHAM, ANDERSON, PROBST & WHITE, ARCHITECTS

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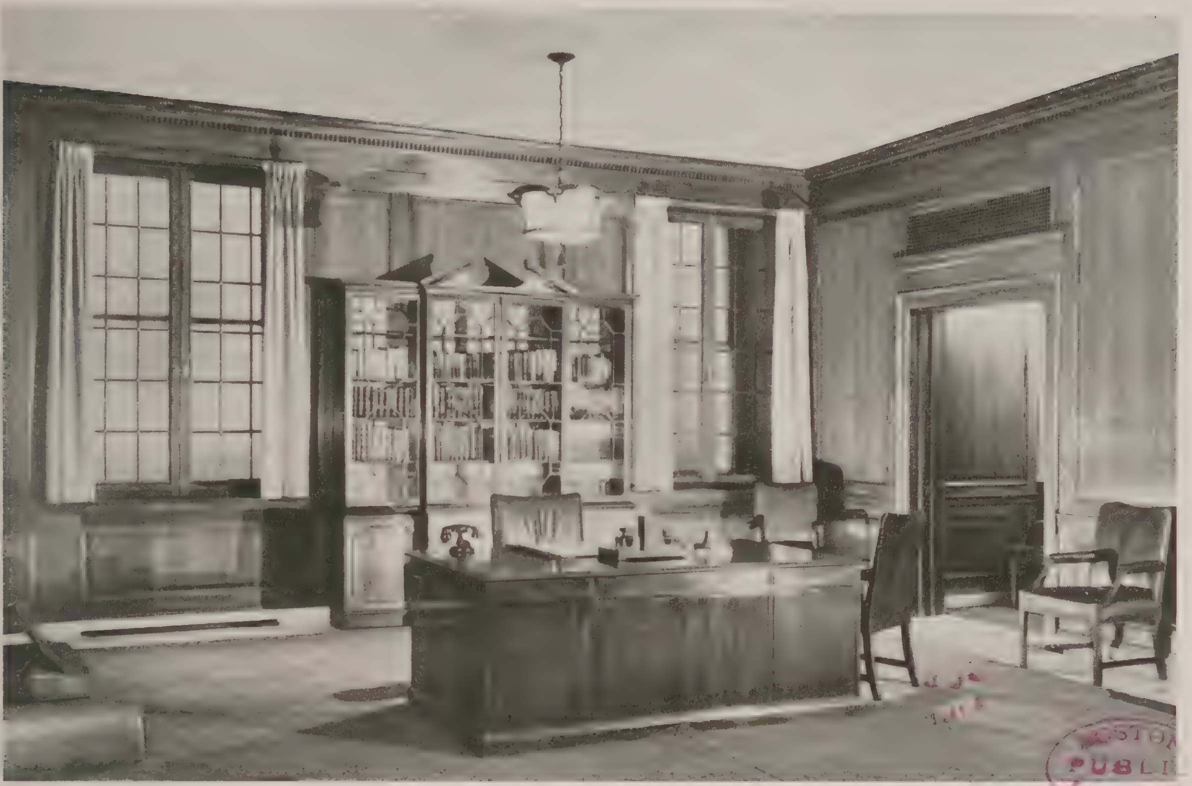

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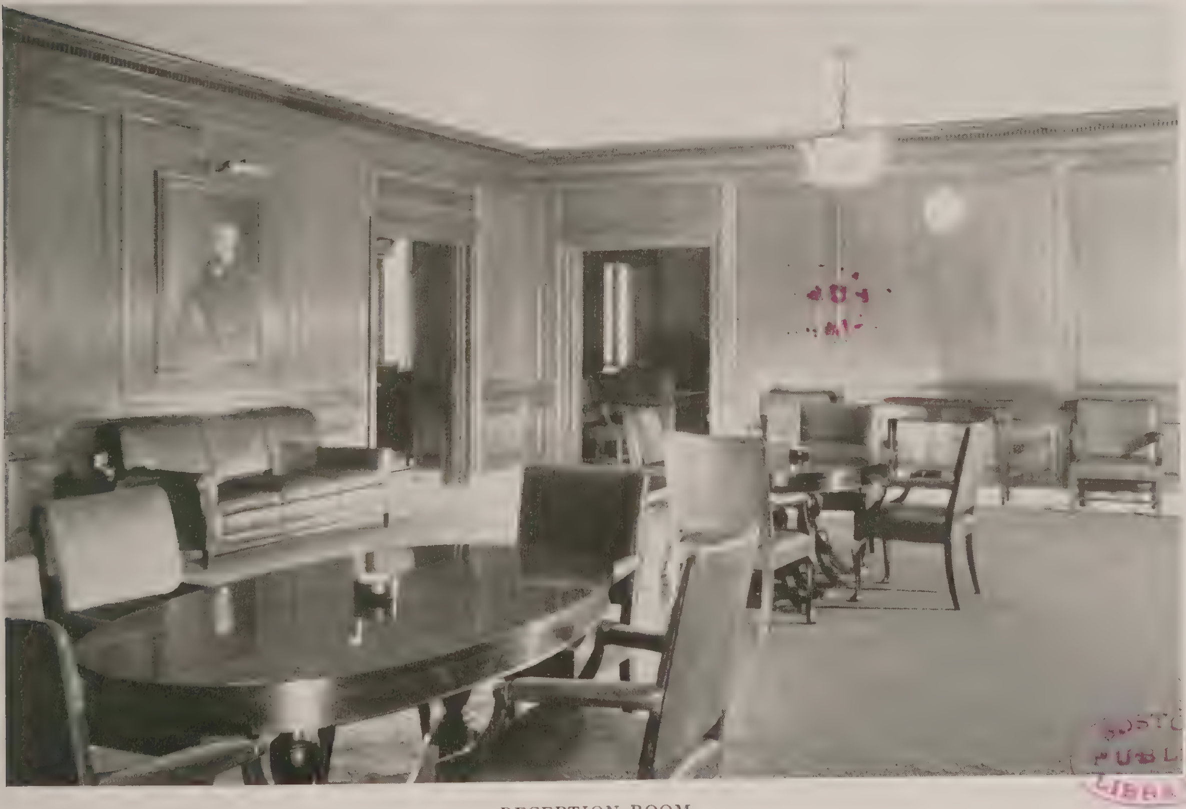

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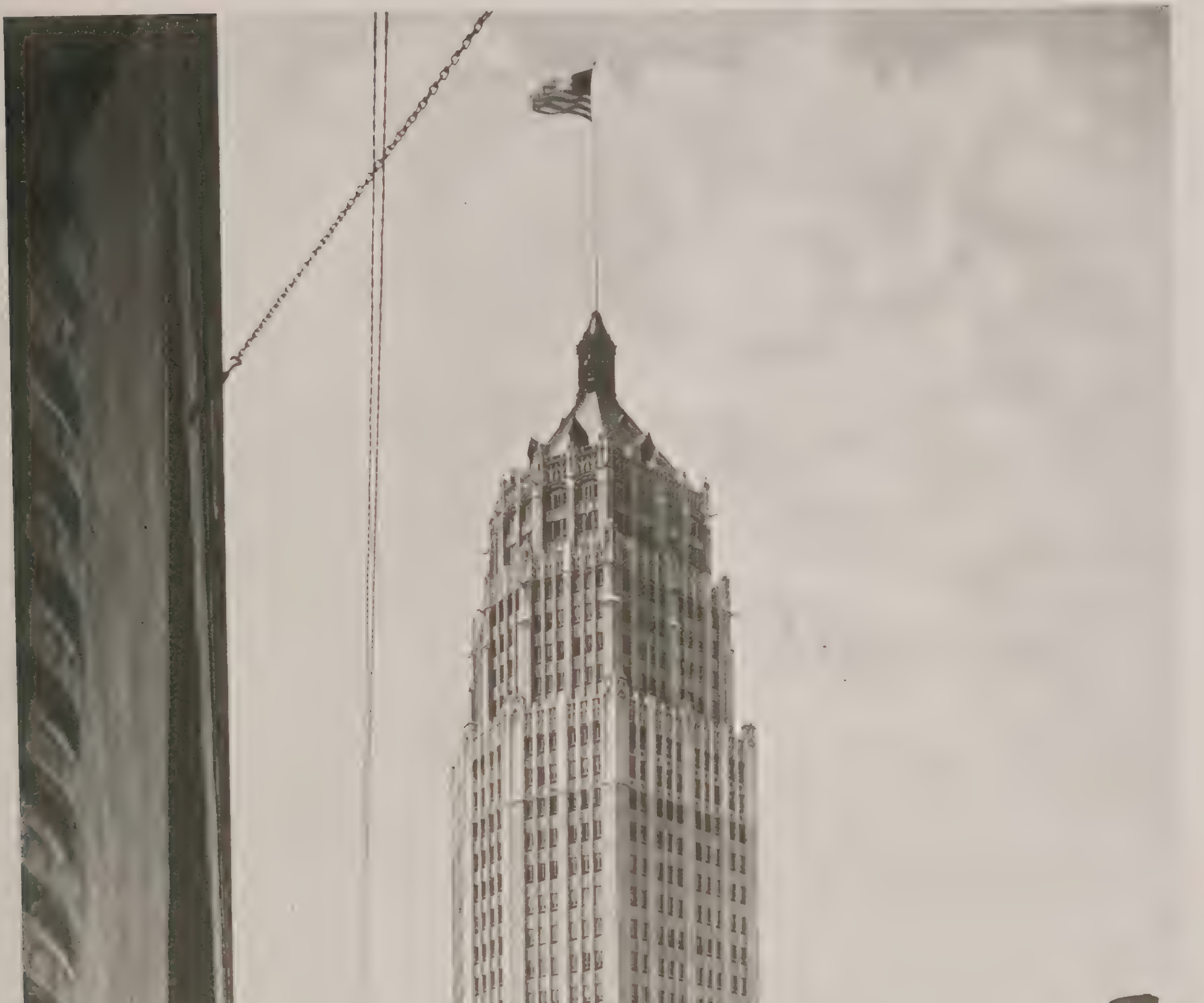
RECEPTION ROOM

CHASE NATIONAL BANK BUILDING, NEW YORK

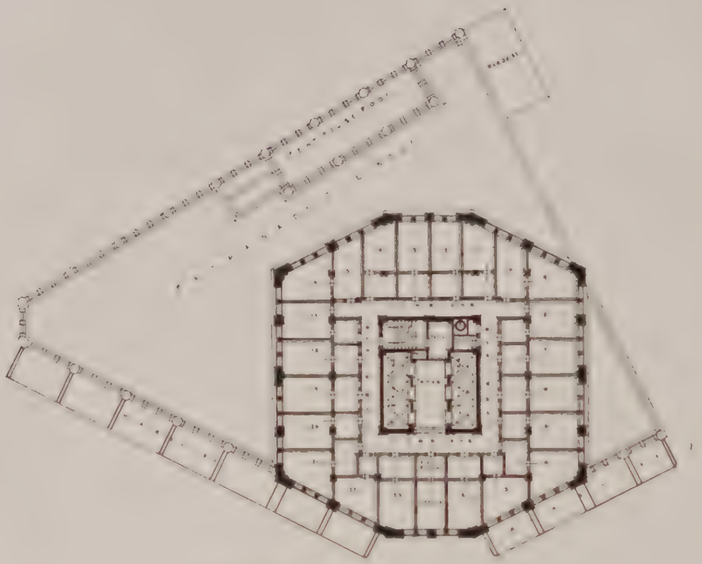
GRAHAM, ANDERSON, PROBST & WHITE, ARCHITECTS



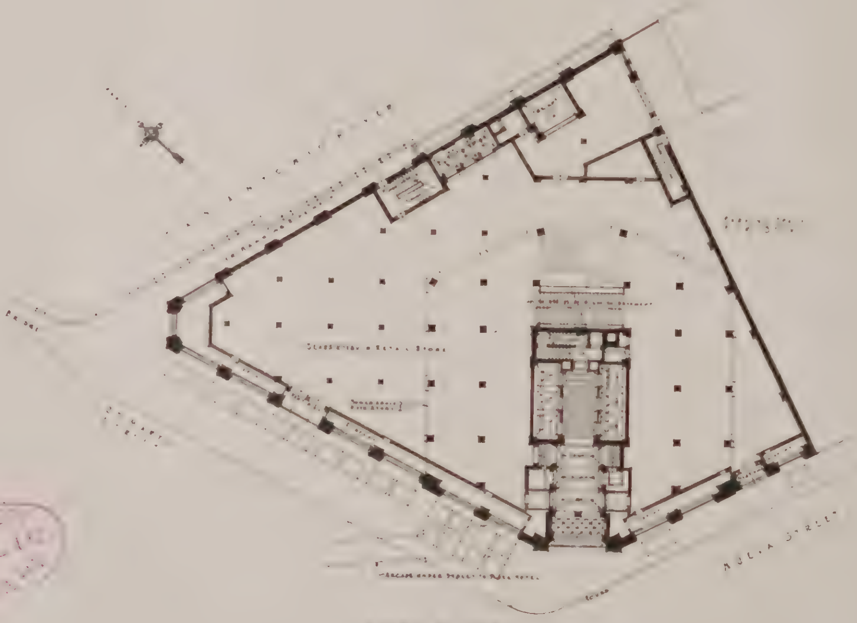
Photos. Harvey Patteson

Plans on Back

SMITH-YOUNG TOWER BUILDING, SAN ANTONIO
ATLEE B. & ROBERT M. AYRES, ARCHITECTS



A TYPICAL OFFICE FLOOR



FIRST FLOOR

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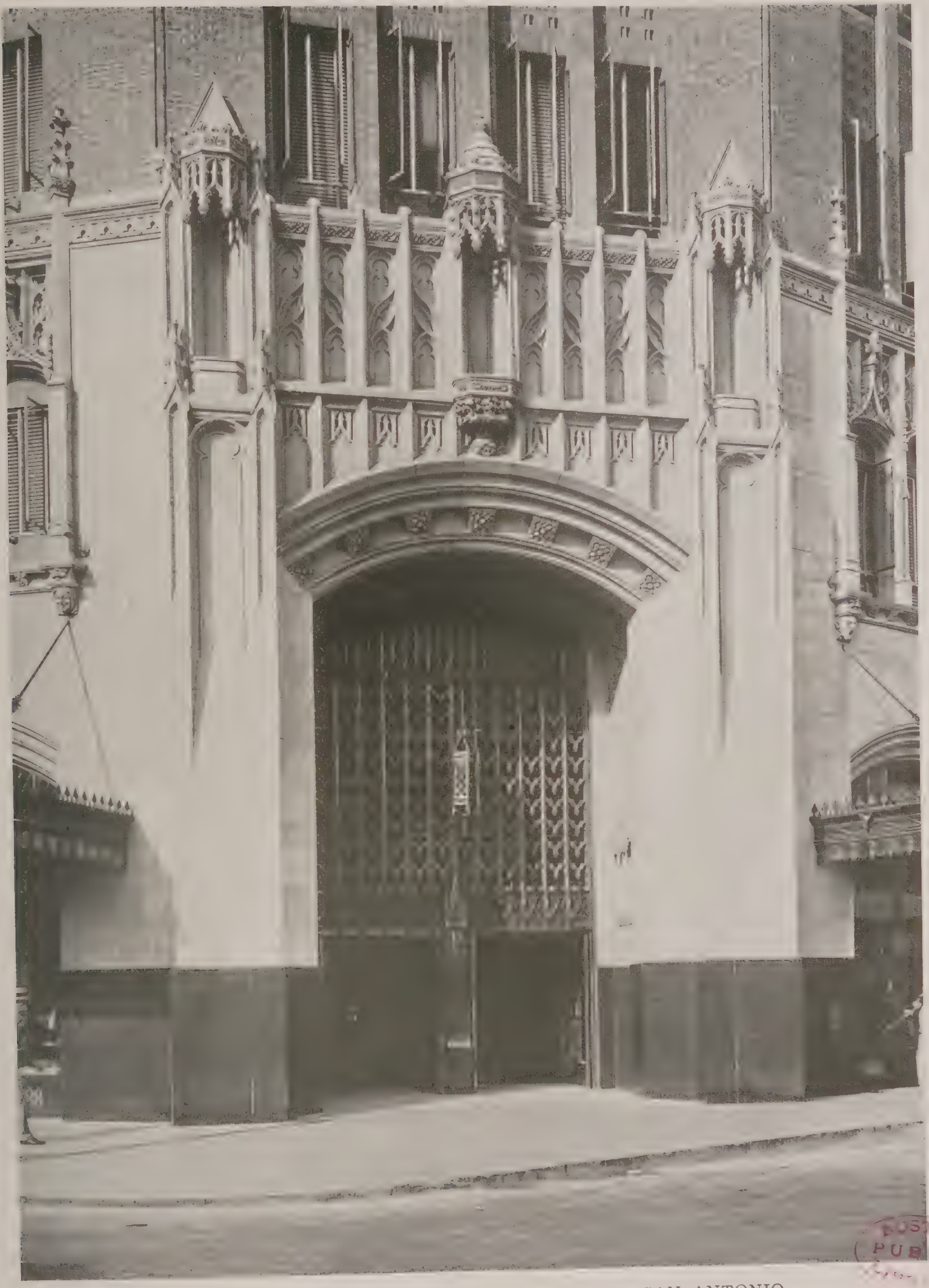
PLANS. SMITH-YOUNG TOWER, SAN ANTONIO
ATLEE B. & ROBERT M. AYRES, ARCHITECTS



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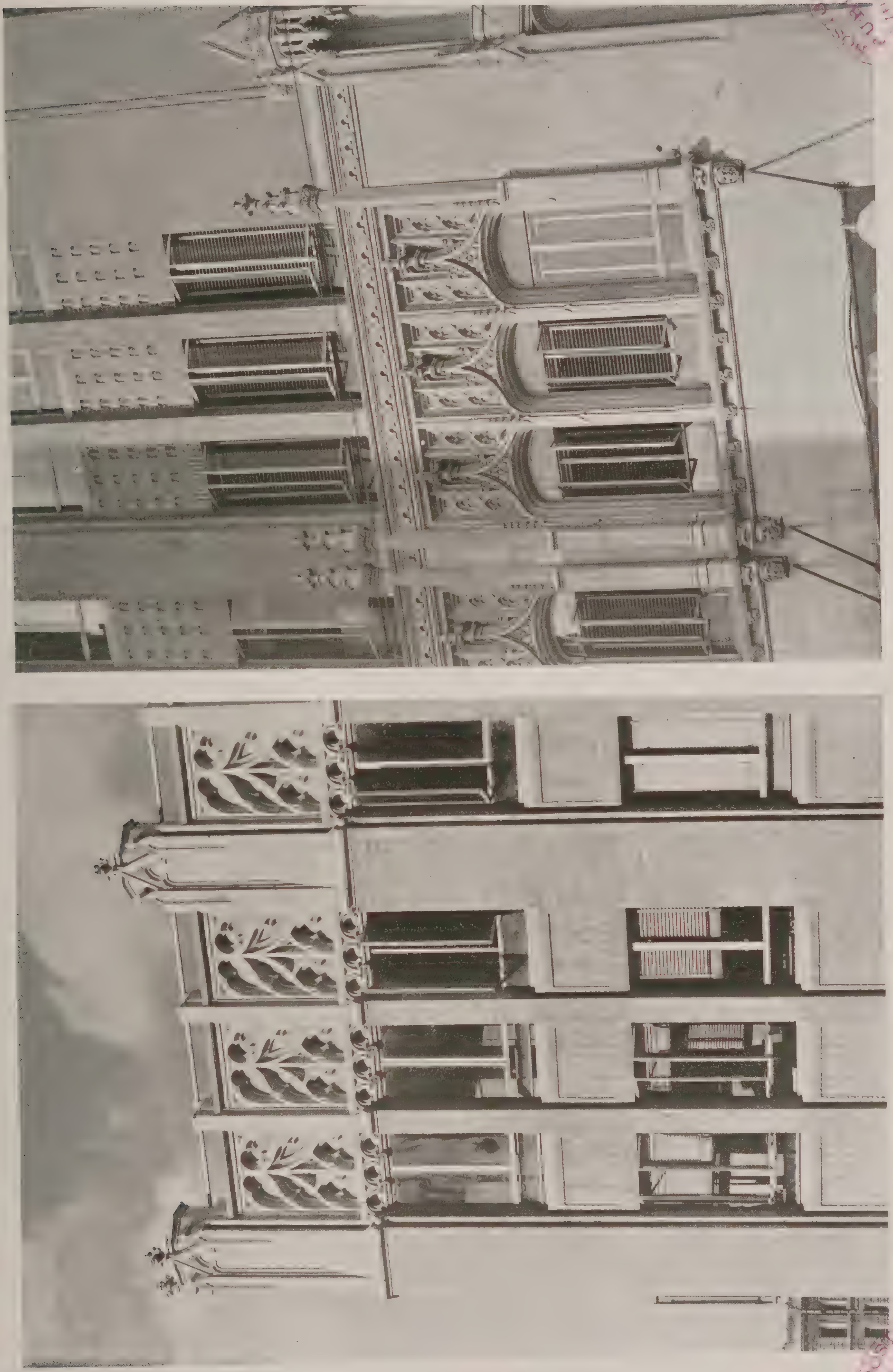
ENTRANCE. SMITH-YOUNG TOWER BUILDING, SAN ANTONIO
ATLEE B. & ROBERT M. AYRES, ARCHITECTS



DETAIL OF UPPER STORIES
SMITH-YOUNG TOWER BUILDING, SAN ANTONIO
ATLEE B. & ROBERT M. AYRES, ARCHITECTS

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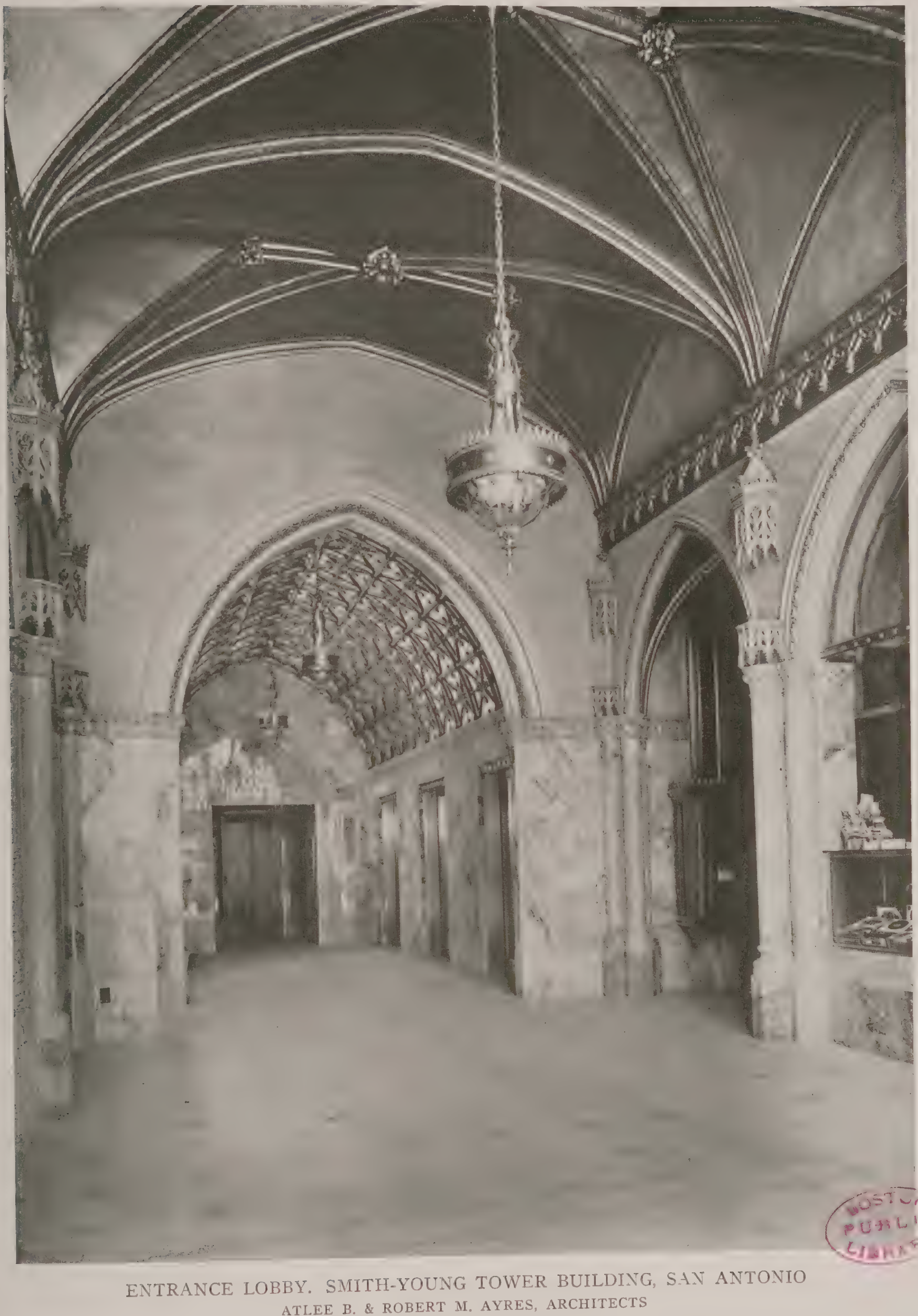

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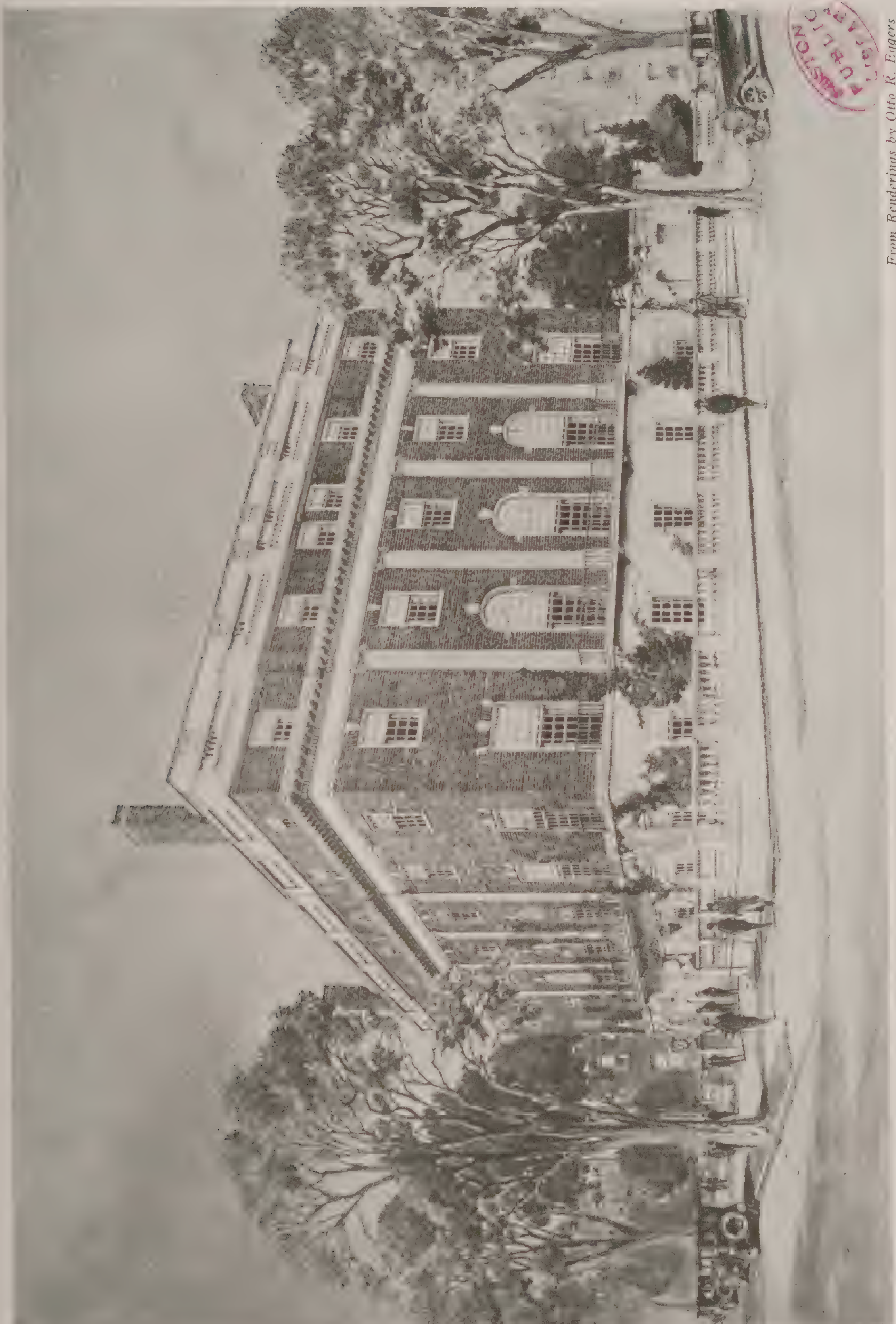
ENTRANCE LOBBY. SMITH-YOUNG TOWER BUILDING, SAN ANTONIO
ATLEE B. & ROBERT M. AYRES, ARCHITECTS



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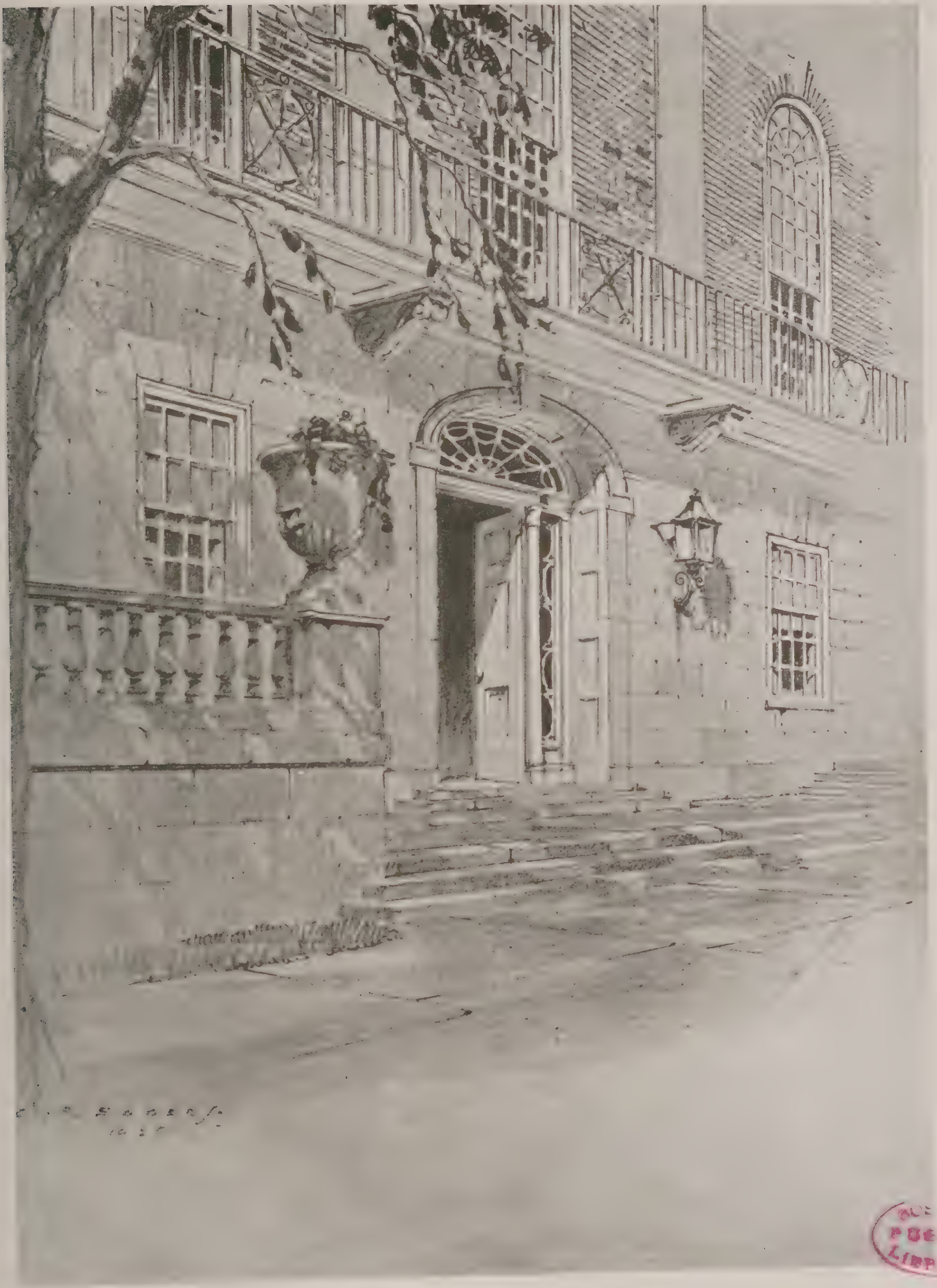
From Renderings by Otto R. Eggers

UNIVERSITY CLUB, MILWAUKEE
OFFICE OF JOHN RUSSELL POPE, ARCHITECT



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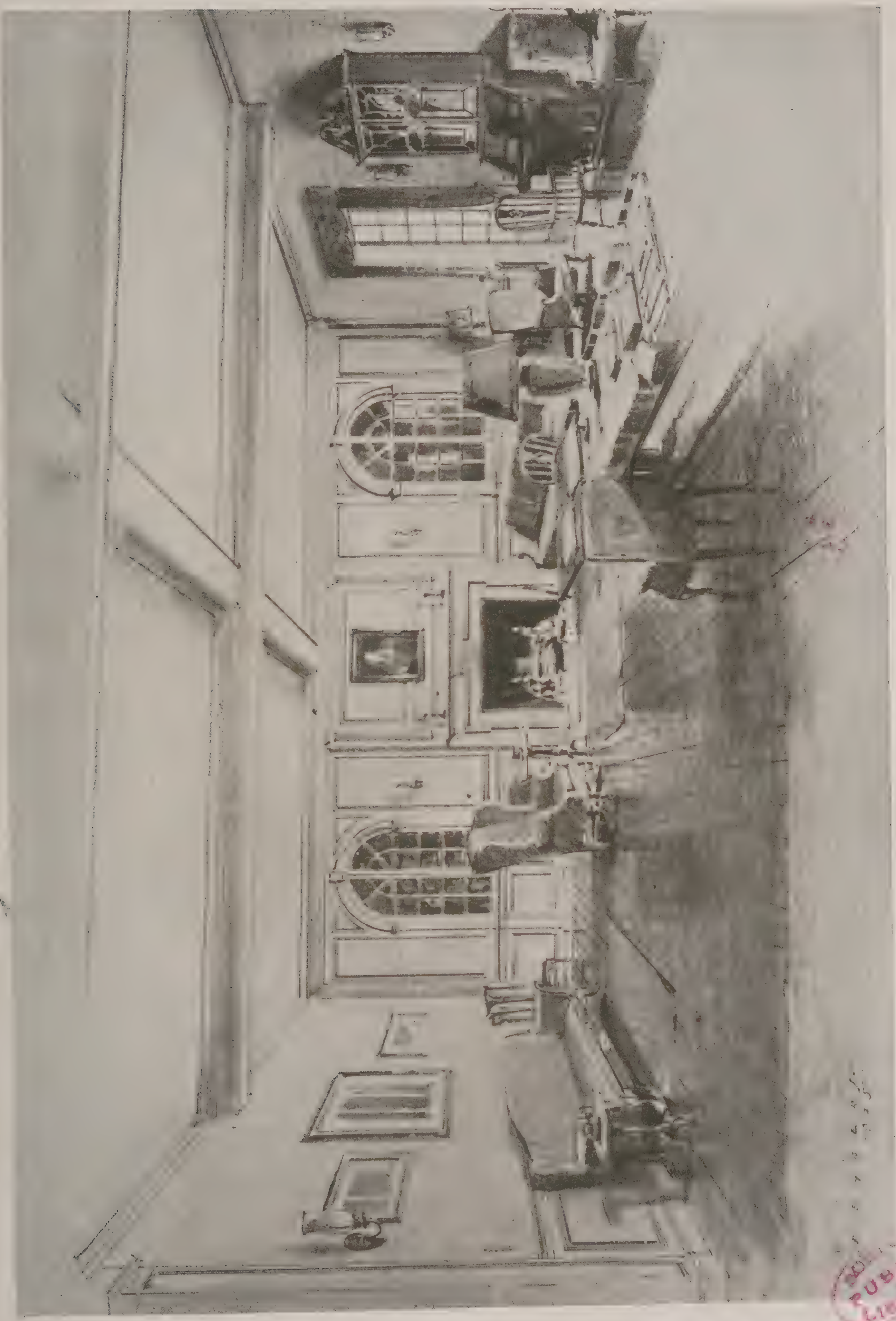

LIVING ROOM. UNIVERSITY CLUB, MILWAUKEE
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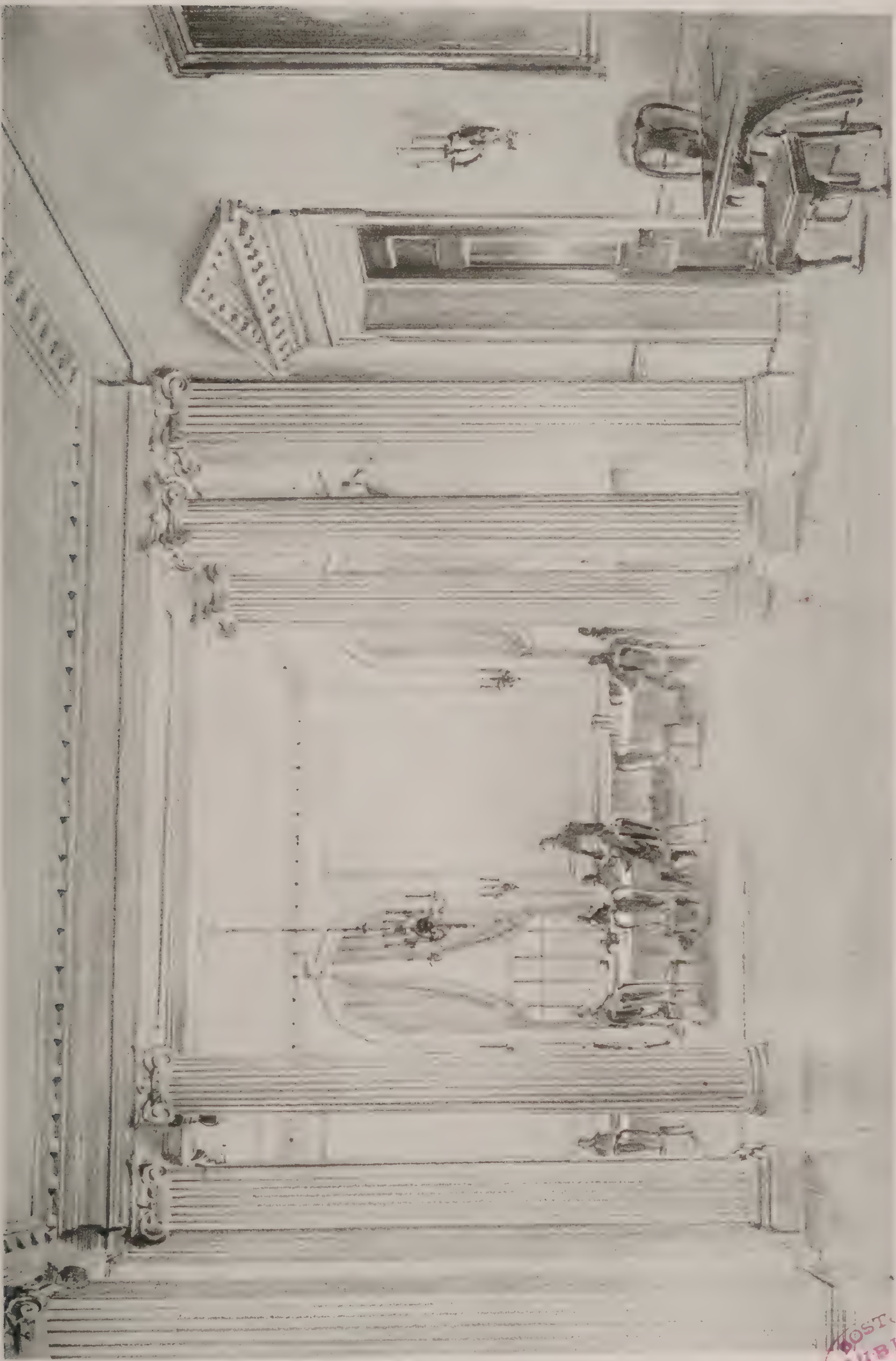

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MODERN ARCHITECTURE IN GERMANY

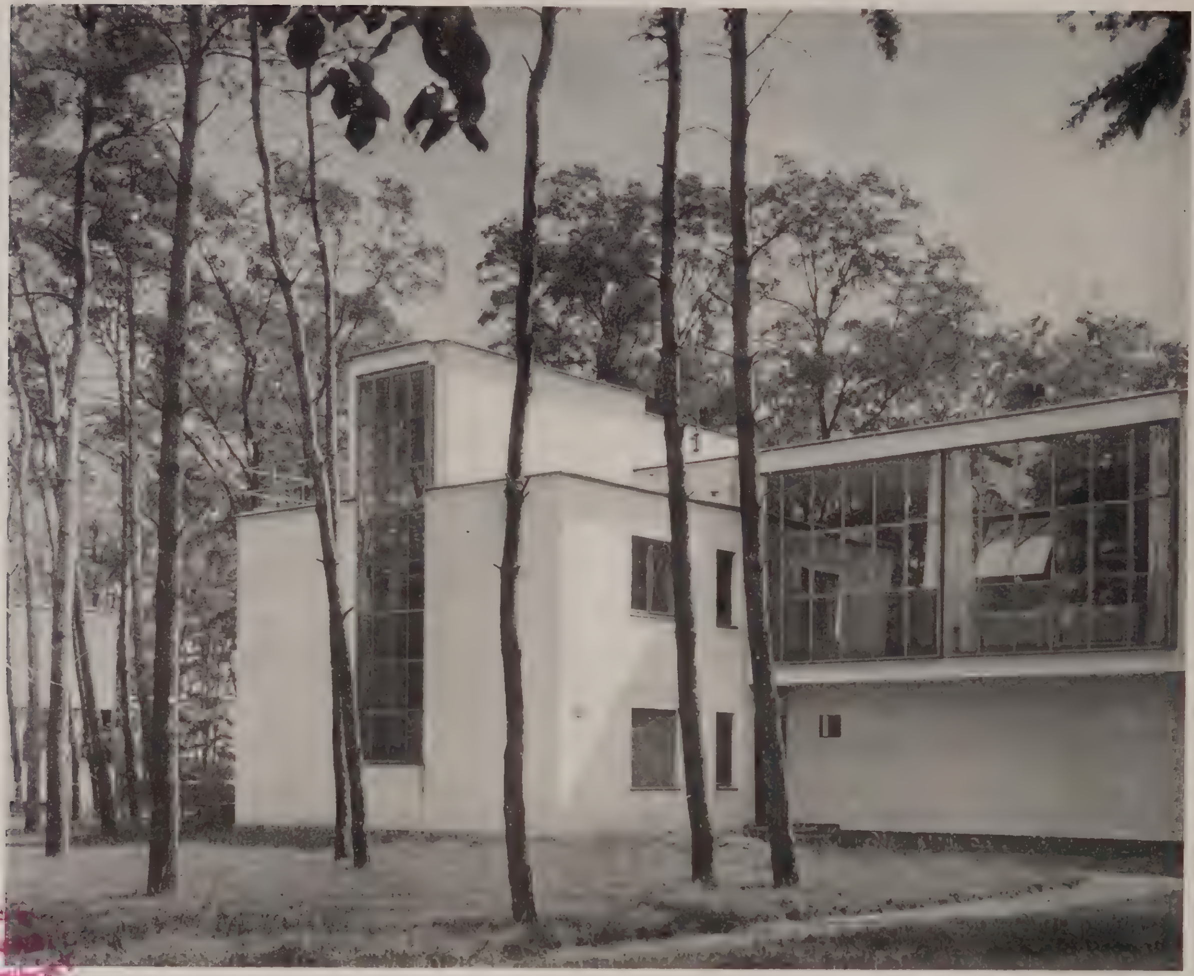
TEXT BY
EDWIN A. HORNER
PHOTOGRAPHS BY
SIGURD FISCHER

UPON crossing the border from Holland into Germany, one immediately realizes that there is a decided contrast in the prosperity of the two countries, as evidenced in the sudden change in the condition of the roads and the general aspect of disrepair prevailing in Germany. However, after proceeding farther into the country and visiting such cities as Hanover, Magdeburg, Berlin and Hamburg, this first impression gives way to a feeling of admiration for the manner in which the German people with their characteristic thoroughness and directness of purpose have been rehabilitating their country along modern lines, inspired by American methods of efficiency.

While the volume of new building in Germany is small in comparison to that of Holland, the same ideas of logic and simplicity are the underlying influences in the design, coupled with a necessary third,—economy. The results in many instances, where there has not been an extreme attempt to express the machine age in which we live, have been very good. We find also extremists who maintain that architecture is purely functional, that into it should be incorporated only the barest elements necessary to its functional purpose, and that it will eventually through a process of public education come to be regarded as beautiful for its simple truthfulness. While this theory of simple truthfulness may indicate a fundamental step in the evolution of a modern style of architecture, our own personal feeling is that such residences as those in Dessau by Walter Gropius are devoid of any element of charm which will cause them to endure as monuments of our age. The little residence of Carl Fieger, architect, in Dessau has somewhat the same aspect externally, but when one observes the interior features which literally express this machine age of ours, one sees a logically efficient plan which is commendable. The built-in buffet-closet between the kitchen and the living-dining room, so arranged that it eliminates the necessity of having a serving pantry and saves many steps for the housewife, is a feature that might well be adapted to our small house problem. The living room furniture is of tubular steel frames, the easy chairs having canvas seats and backs, as designed by Marcel Breuer of Dessau.

However, our chief interest is not in the residential architecture of Germany, for we Americans require something more than mere efficiency in a home. Among the best of the commercial buildings that we found is the *Anzeiger Hochhaus* in Hanover, home of the Hanover *Anzeiger* publications. The architect, Fritz Hoger of Hamburg, who is also architect of the *Chilehaus* in Hamburg, with which many of us are familiar, has used his favorite medium,—brick pattern work,—as the only form of ornamentation on the exterior. While the building is only ten stories high, with a "planetorium" dome superimposed, it has a decided vertical feeling, which is the essential point of emphasis in a tall building. There is current an opinion that tall structures framed with steel or reinforced concrete should be so designed as to express externally the actual methods of their construction, a theory which if exercised would produce as a result tiers of rectangular units laid horizontally, due to the fact that structural beams are longer than the story heights. This is the theory behind the design of Eric Mendelsohn's *Deukon Haus,* his alterations to the Rudolph Mosse Company's building, and his building for the C. A. Herpich Sohne department stores, all in Berlin. Personally, we are inclined to feel that the results thus achieved are not as pleasing as they might be, when one allows the mass and height of a structure to express the fact that it is made possible only by the use of steel or reinforced concrete, with the resultant height emphasized in the design by vertical lines as has been done with the *Anzeiger Hochhaus.* The interiors of this building are carried out in the same spirit of simplicity that we find throughout Dutch and German architecture. The directors' room is done in plain oak surfaces in alternating dark and light bands, with very few mouldings, such as there are being square in contour and in scale with the plainness of the room. A simple beamed ceiling, lighting fixtures treated in straight lines, and floor and table tops done in parquetry carry out the spirit of the room. On the roof is the "planetorium," a large hemispherical dome under which is a projecting machine to reproduce the various constellations of the heavens on the white "sky," used for public lectures on astronomy.

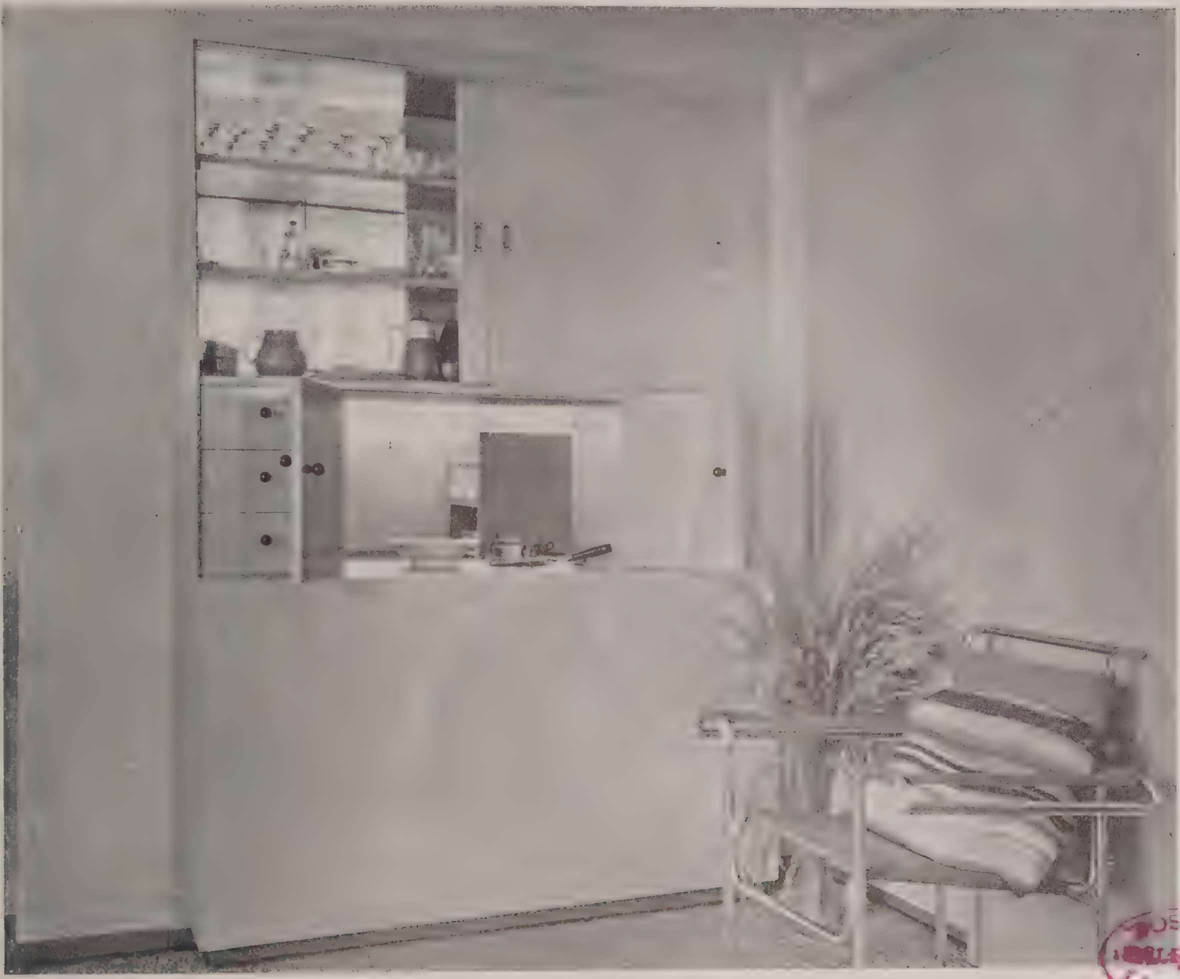
Another very good *hochhaus,* or high building, is the *Ballinhaus* in Hamburg by Hans Oskar Gerson. The elevations are very plain with the exception of a few sculptured figures, the chief interest being in the handling of corners and offsets. In Dessau we find another example of extreme modernism in the *Bauhaus* by Walter Gropius. The *Bauhaus* is a school of architecture, or "architect factory," as it were. Although well planned and excellently lighted, we hesitate to predict the future of architecture inspired by such



Professor's Residence, Bauhaus, Dessau
Walter Gropius, Architect

academic surroundings. Contrasted to this is the *Stadthalle* in Magdeburg by Johannes Goederitz, together with its adjacent group of exposition buildings by Albin Muller. Here we have good creative design, simply and economically done, and with excellent effect. Here again we have an interesting use of brick and terra cotta forming the only exterior ornamentation, with a result that is not spotty and which for that reason is more effective than the *Anzeiger Hochhaus*. The interior of the great assembly hall is treated with alternating dark and light bands above the balcony, with a herringbone pattern executed in beaded wainscot stock below and on the rail of the balcony. The lighting fixtures are extremely simple, consisting of three plain white globes suspended at varying heights, each from a single conduit cord, the three being linked together to form a unit. The exposition buildings, in all their plainness, are most excellent in their proportions. One experiences a thrill of delight upon seeing the whole ensemble illuminated at night by the strangely grotesque lighting fixtures which flank the great central paved court of the group.

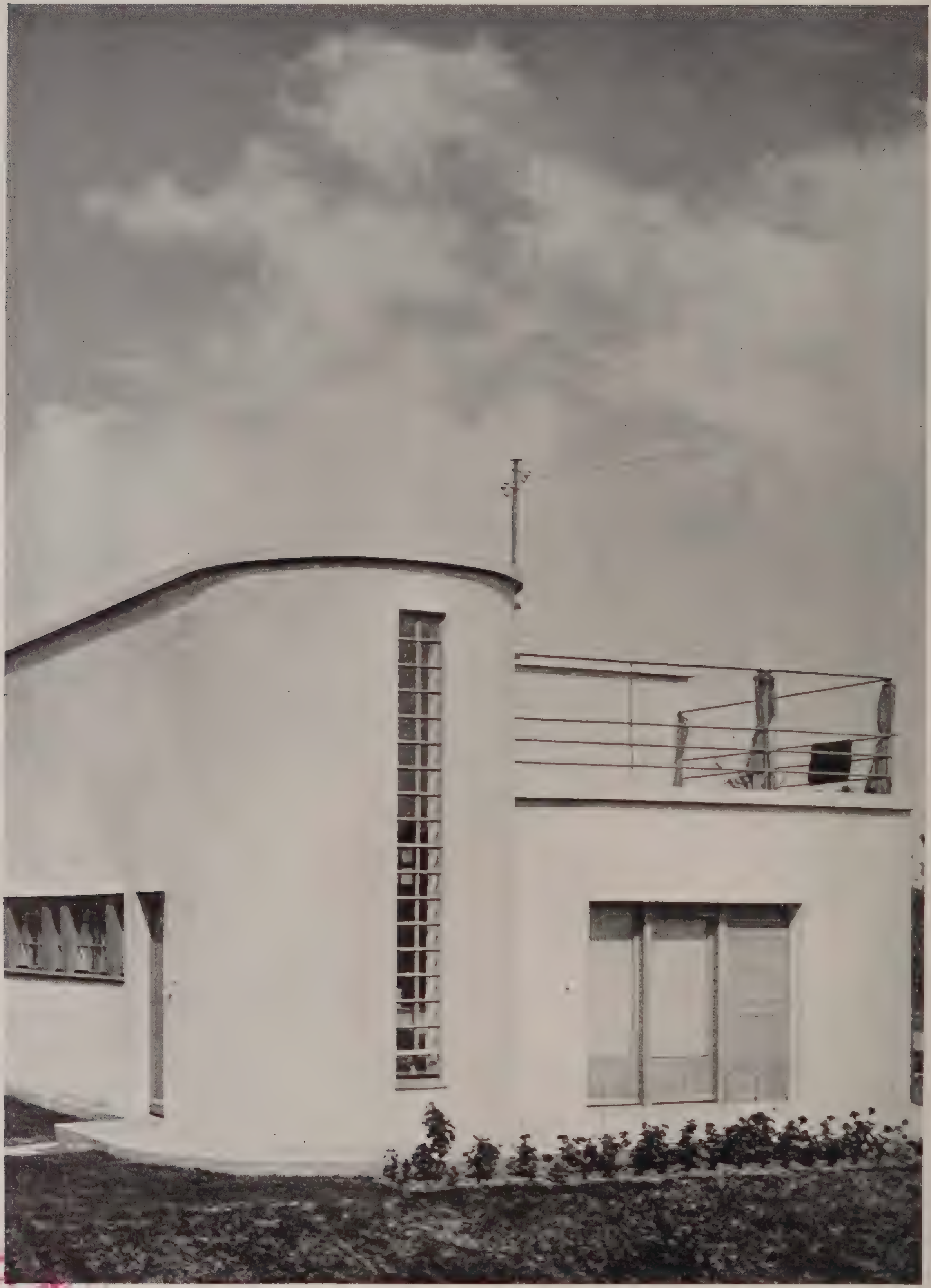
In Berlin we find another very good example of effective lighting in the Titania motion picture theater. Schoffler, Schonbach & Jacoby are the architects. The alternating dark and light bands which treat the exterior of what perhaps may be a ventilating shaft are illuminated in a way that is not at all unpleasant. We might say, without intending a pun, that the design is quite theatrical, but excellent advertising. The little *Kirche auf dem Tempelhofer Feld* in Berlin, designed by Stadtbaurat Brauning, now dead, illustrations of which appeared in the April issue of THE FORUM, is a charming example of modern German ecclesiastical architecture. Externally there is no attempt at ornamentation with the exception of the metal-covered bell cupola which is done in delicate simplicity. The church is circular in plan, a fact which accounts for its peculiarly interesting interior. Around the perimeter of the auditorium is a single row of columns which serve the double function of supporting the balcony and also the ceiling of the auditorium. These columns are plain ten-sided shafts with neither caps nor bases, the corners of



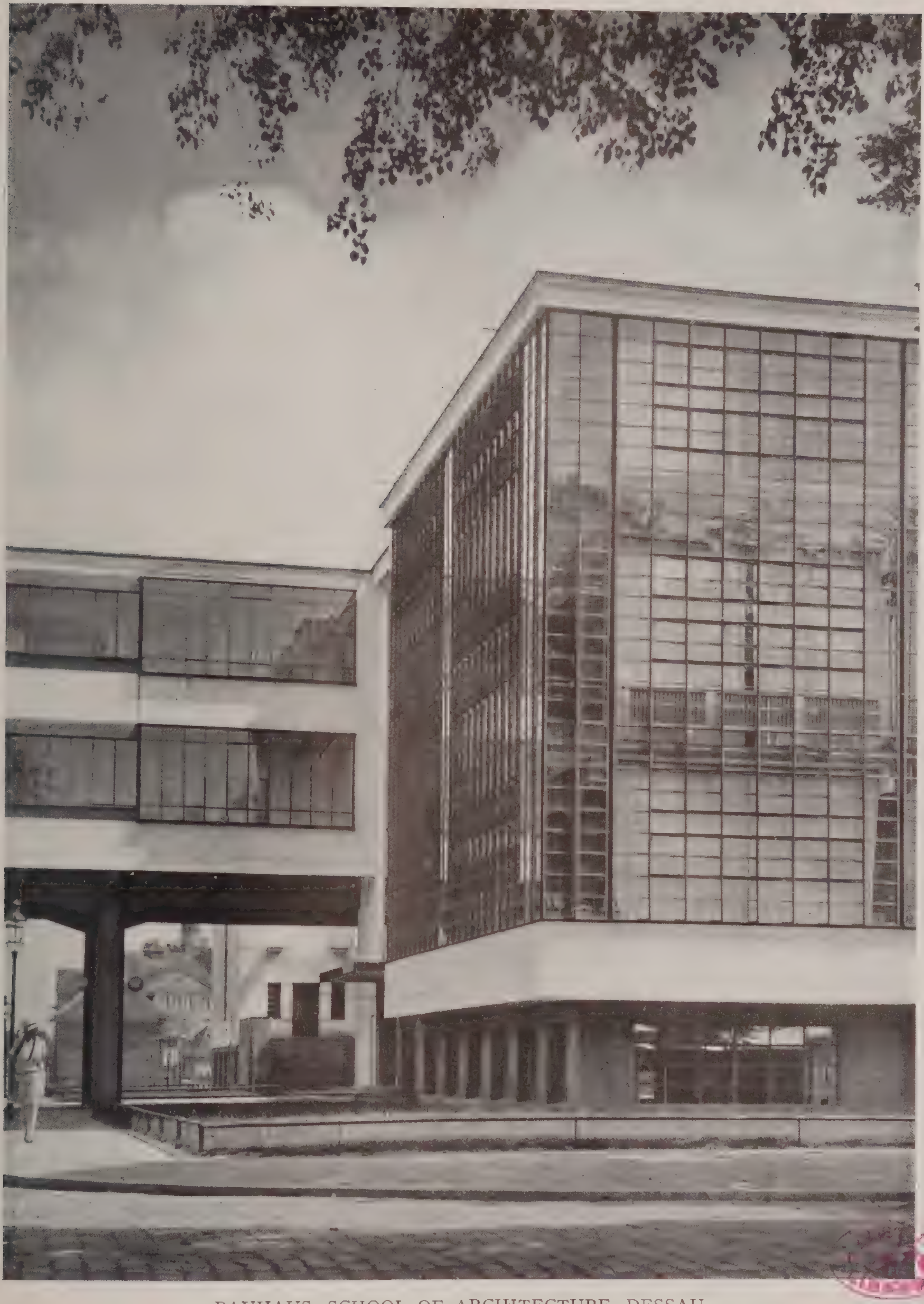
Kitchen Dresser. Residence of Carl Fieger, Dessau
Carl Fieger, Architect

the shafts merging into the channels between the ribs of the intricate system of plaster vaulting. The ceiling is not unusual in its treatment, the ribs of the intricate design springing from the faces of the column shafts, flowing in graceful curves to converge at the center into a flower of many petals. The entire ceiling is white, depending for its interest on the play of light and shade in diamond-shaped coffers covering the surface.

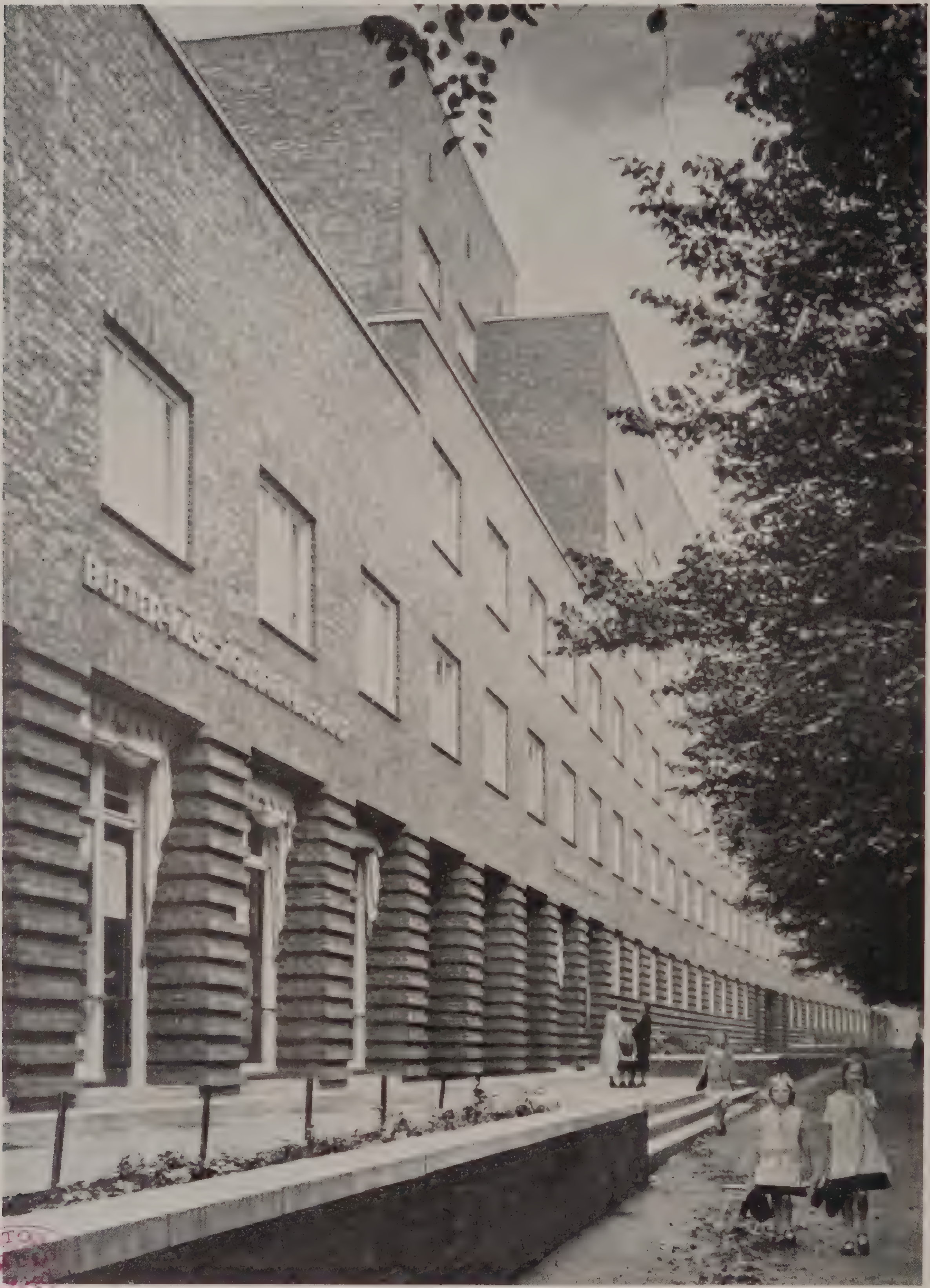
Two buildings somewhat similar in purpose but very unlike in their design are the structure for the *Verband der Deutscher Buchdrucker* (German Bookprinters Labor Union) and that for the *Ullstein Druckhaus,* both in Berlin. The former was designed by Max Taut, the latter by E. G. Schmohl. The *Verband der Deutscher Buchdrucker* building is of interest chiefly for its interiors which, though quite plain, are at the same time unusual. The assembly hall on the top floor has a wall treatment of flush woodwork, a herringbone effect being worked out by varying the direction of the grain in the veneer. The only interruptions in the plain wall surfaces are the window reveals and the ventilating louvers over doors and closets. Ceiling beams framing a hip roof are exposed as part of the design. The lighting fixtures, which are a bit restless in a room of such otherwise simple treatment, give the only disturbing element. The principal stair hall is treated with tile wainscoting to the ceiling, the colors being those of the new German Republic,—black, red and yellow. On the ground floor, as one approaches the stairway, one is confronted with a modernistic conception of the official coat of arms of the society executed in metal in high relief. The elevator enclosure is of glass set in a bronze framework, and the elevator itself is automatic, operated without an attendant. This type of elevator is commonly used in business and hotel buildings on the continent in cases where the volume of traffic does not warrant having an operator. Occasionally also one finds a type of continuously moving elevator operating in such a way that a chain of cars goes up one shaft, over a system of rollers, and down an adjacent shaft, each shaft opening into the corridor, so that a passenger need only step into the car of his choice. In spite of the use of carefully arranged



RESIDENCE OF CARL FIEGER, DESSAU
CARL FIEGER, ARCHITECT



BAUHAUS, SCHOOL OF ARCHITECTURE, DESSAU
WALTER GROPIUS, ARCHITECT



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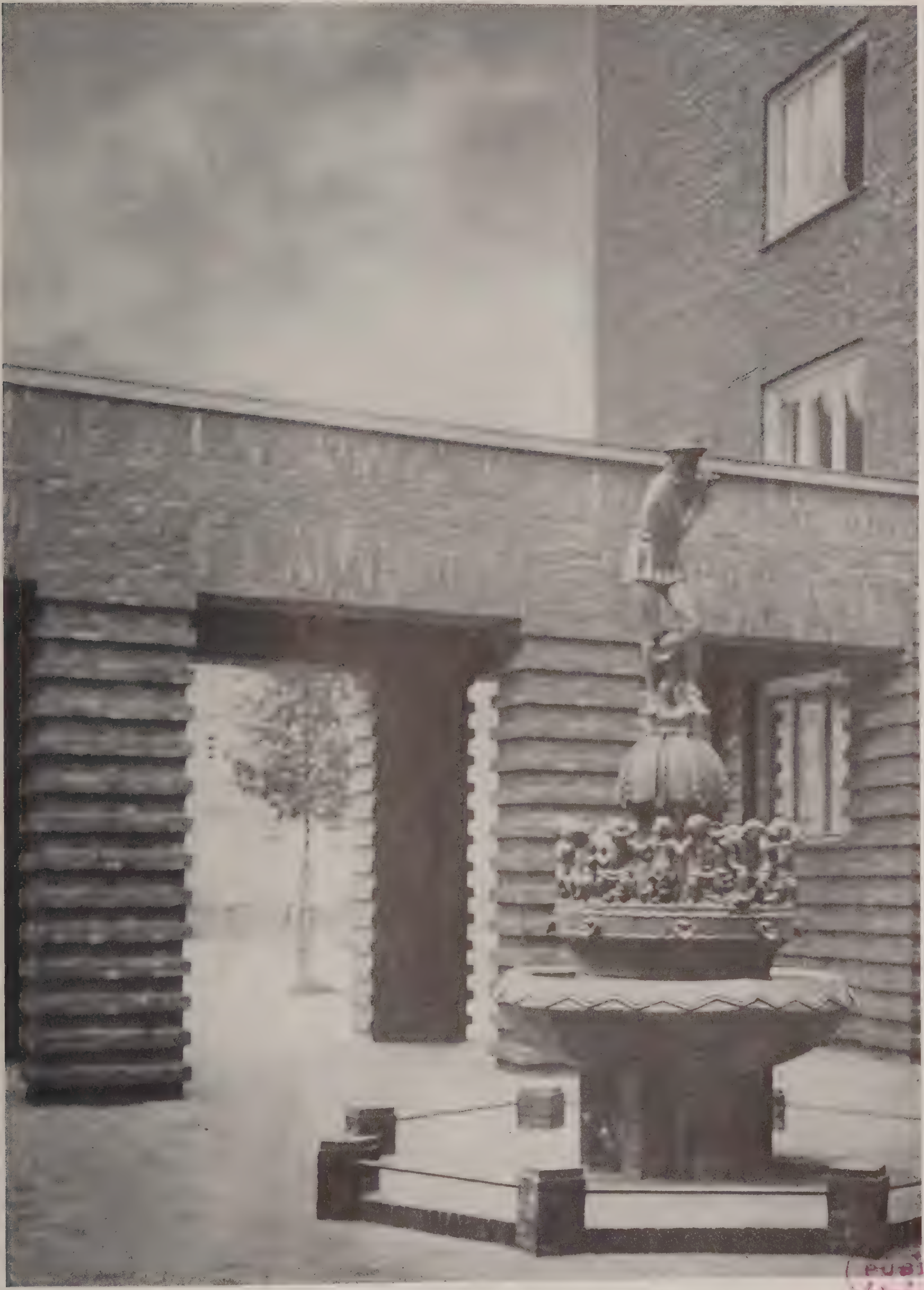
AN APARTMENT HOUSE, HAMBURG



COURT, APARTMENT HOUSE, HAMBURG

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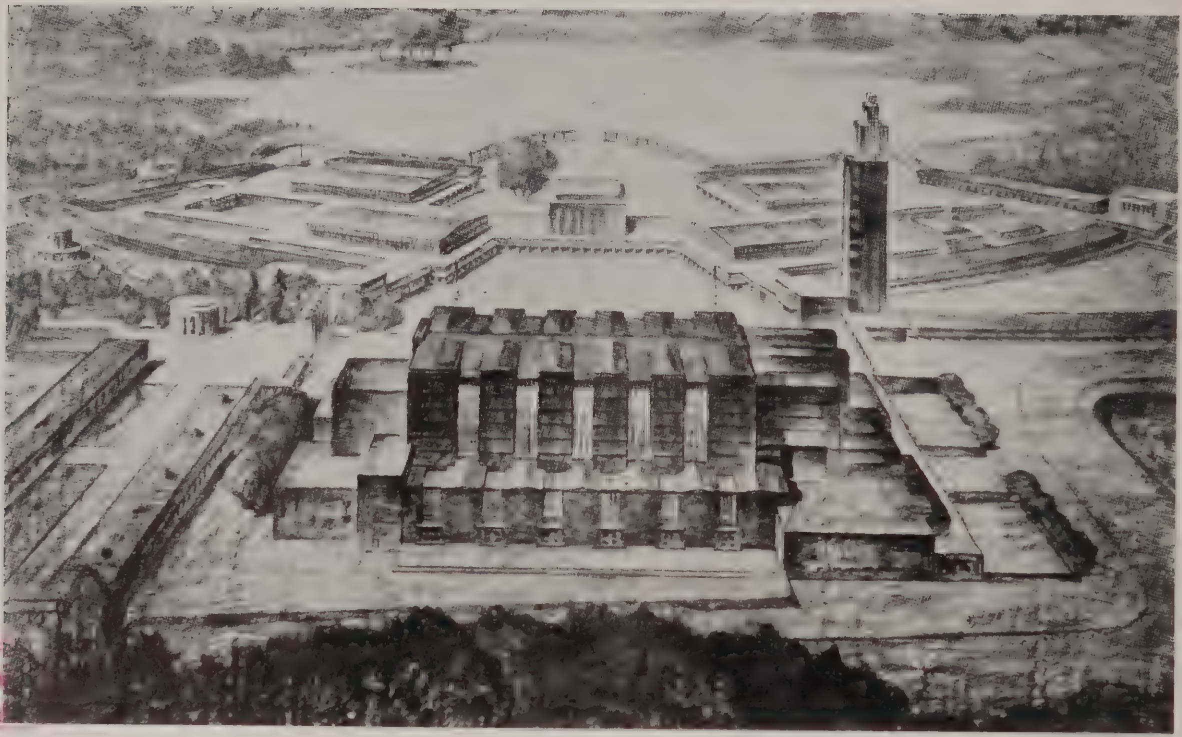


Stadthalle Magdeburg
Johannes Goederitz, Architect
Exhibition Buildings in Background, Albin Muller, Architect

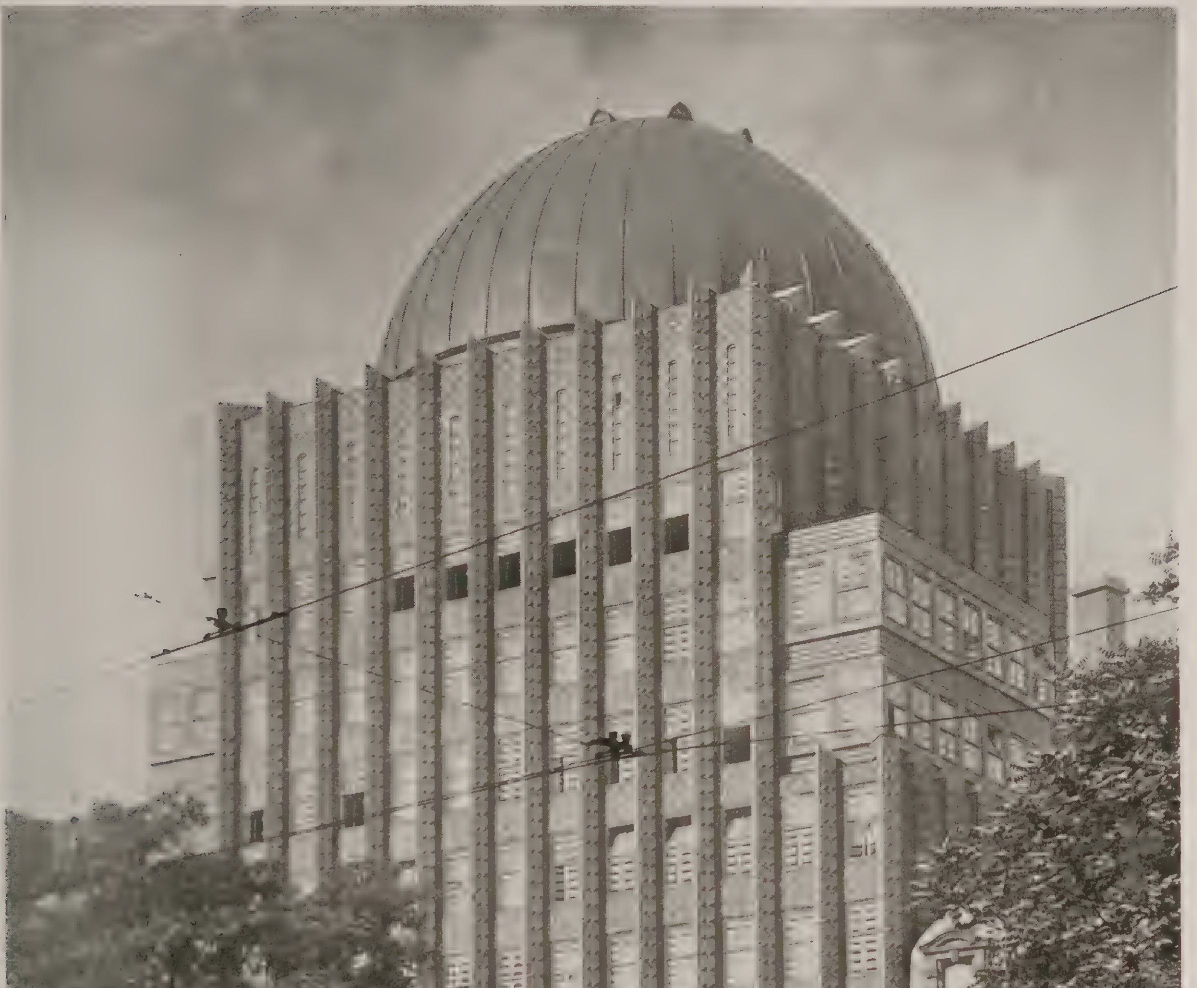
safety devices, however, it is at best hazardous.

The *Ullstein Druckhaus*, already mentioned, is one of the best of the new buildings in Berlin. It houses the activities of a very large publishing company, and within its walls are carried on all the processes required by the printing industry. We were cordially received and conducted through the entire building, from basement to roof. Entering the great lobby one is immediately impressed by its simple grandeur. The reader may tire of the reoccurrence here of the word "simple"; nevertheless, simplicity is the keynote of all the best continental European architecture of today. There is no need to continue the application of antedated forms because of their historic excellence, when a straightforward use of the materials best adapted to solving the problem can produce such pleasing results as we have seen throughout Holland and Germany. However, lest we be misunderstood, let us repeat the statement made in a previous article, that in Denmark and Sweden we find a modernism based on classicism, but not by rote or formula.

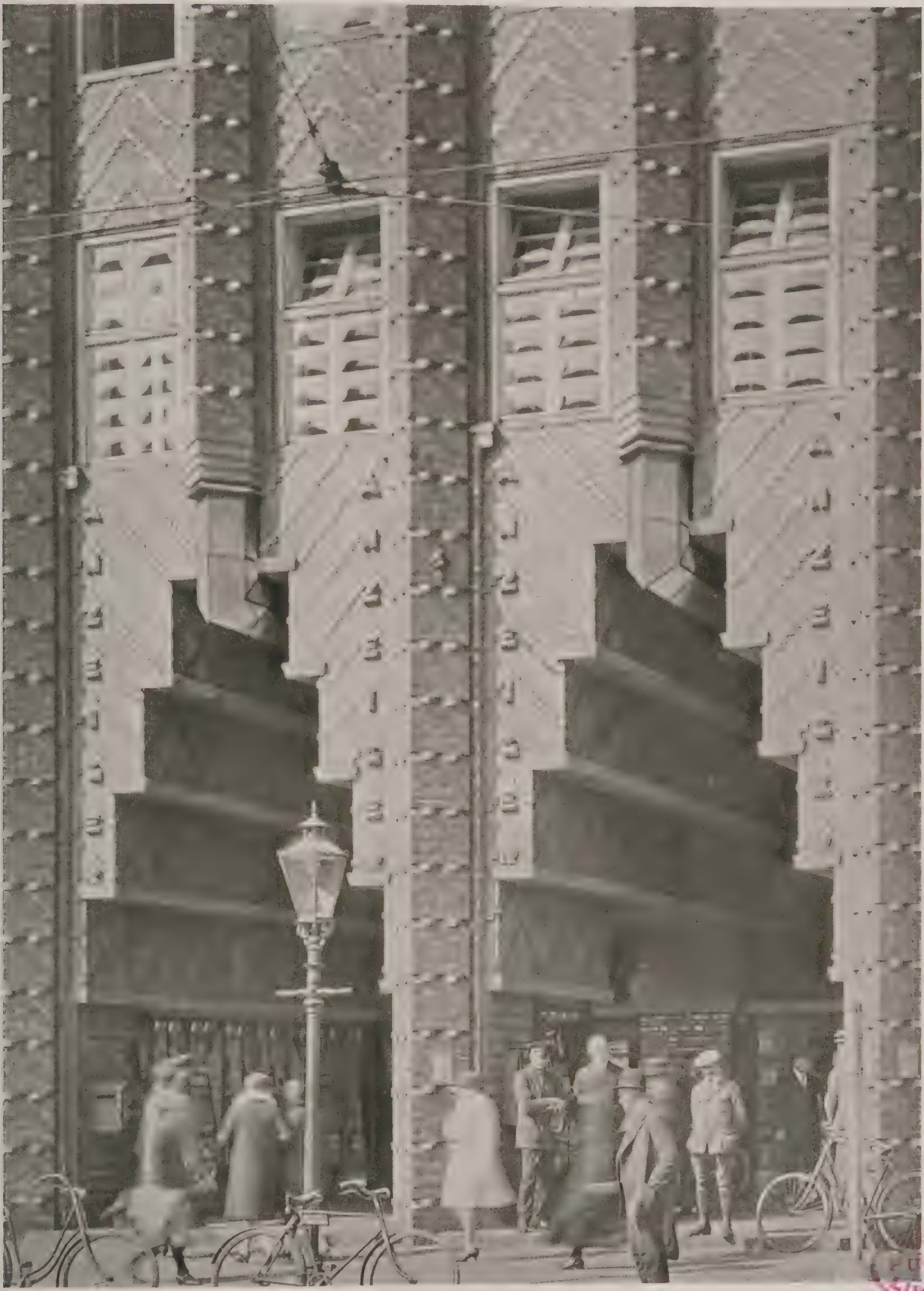
Other architectural features of interest in the interior of the *Ullstein Druckhaus* are the heavy wrought iron covered doors leading from the principal corridors to all rooms of importance, and the unusual method of lighting the main stair shaft with a heavy wrought iron fixture suspended from the topmost ceiling with globes, or rather with lanterns, interspersed at each story. In the basement there is a restaurant with an outdoor arcade and terrace where employes may obtain lunch if they wish and where they may enjoy their occasional glasses of beer during working hours. It might be noted that the more attractive portion of the dining room facing the arcade, and the arcade itself, are reserved for the laboring employes rather than for executives. One is impressed by the excellent scale and taste used throughout this building and is inclined to wish for more of both in architecture as a happy medium between extreme modernism and ultra-conservatism.

In subsequent articles of this series we shall deal with modern Danish and Swedish architecture. In both countries one finds a modernism based on classic precedent, but a classicism which is used with structural logic. And here again one finds logic, simplicity and restraint in the creation of new forms with classic feeling playing important roles in the creation of architecture that is refreshing and inspiring without being freakish.

EDITOR'S NOTE. This is the second article in the series on modern European architecture which were written for THE ARCHITECTURAL FORUM by Edwin A. Horner during his trip abroad a year ago this summer. On this trip Mr. Horner accompanied Sigurd Fischer, the well known architectural photographer, who took for special publication in THE FORUM a series of remarkable photographs of some of the best examples of modern architecture in Europe.



HANOVER ANZEIGER BUILDING
FRITZ HOGER, ARCHITECT



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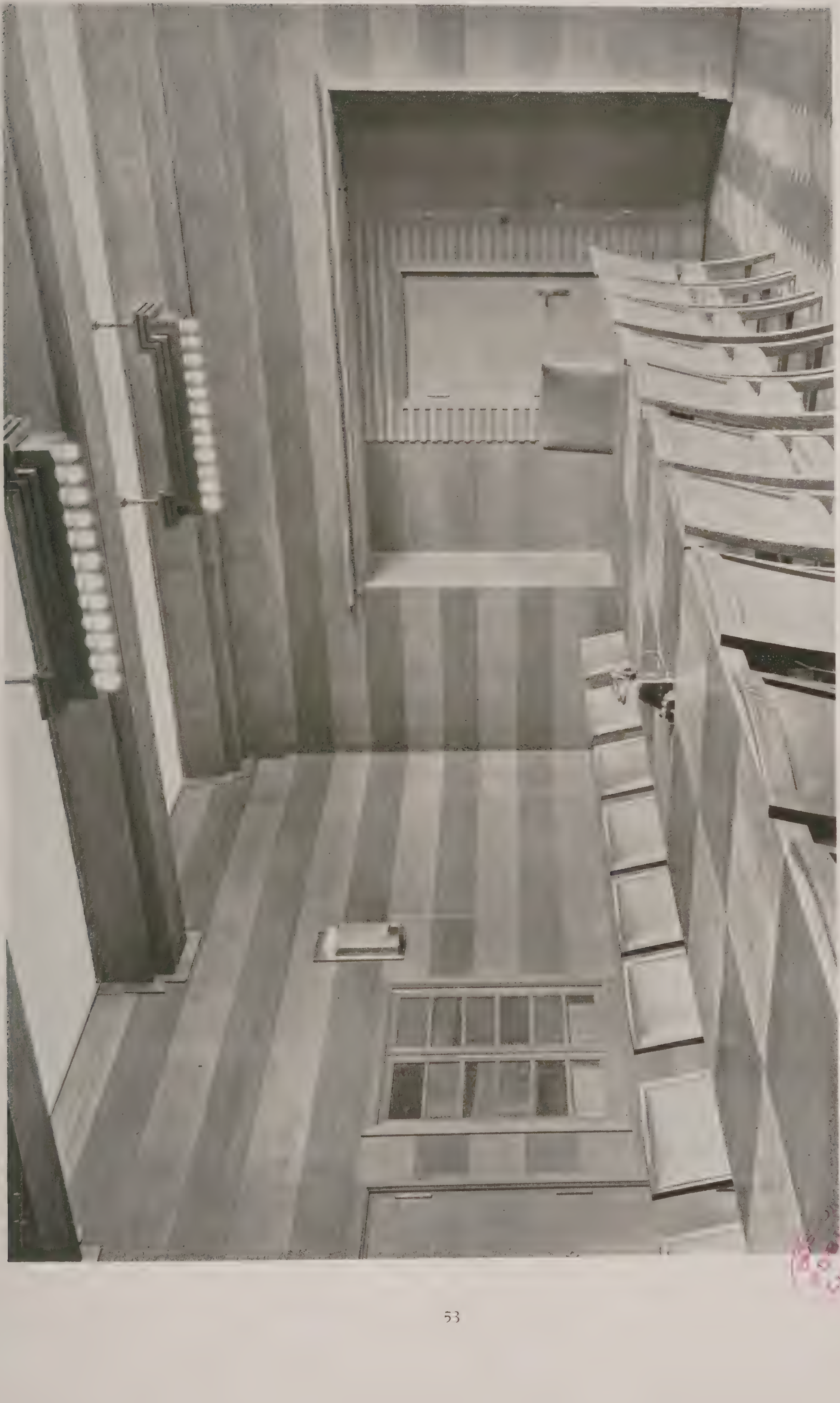
ARCADES AT ENTRANCE, HANOVER ANZEIGER BUILDING
FRITZ HOGER, ARCHITECT



BOARD ROOM, HANOVER ANZEIGER BUILDING
FRITZ HOGER, ARCHITECT

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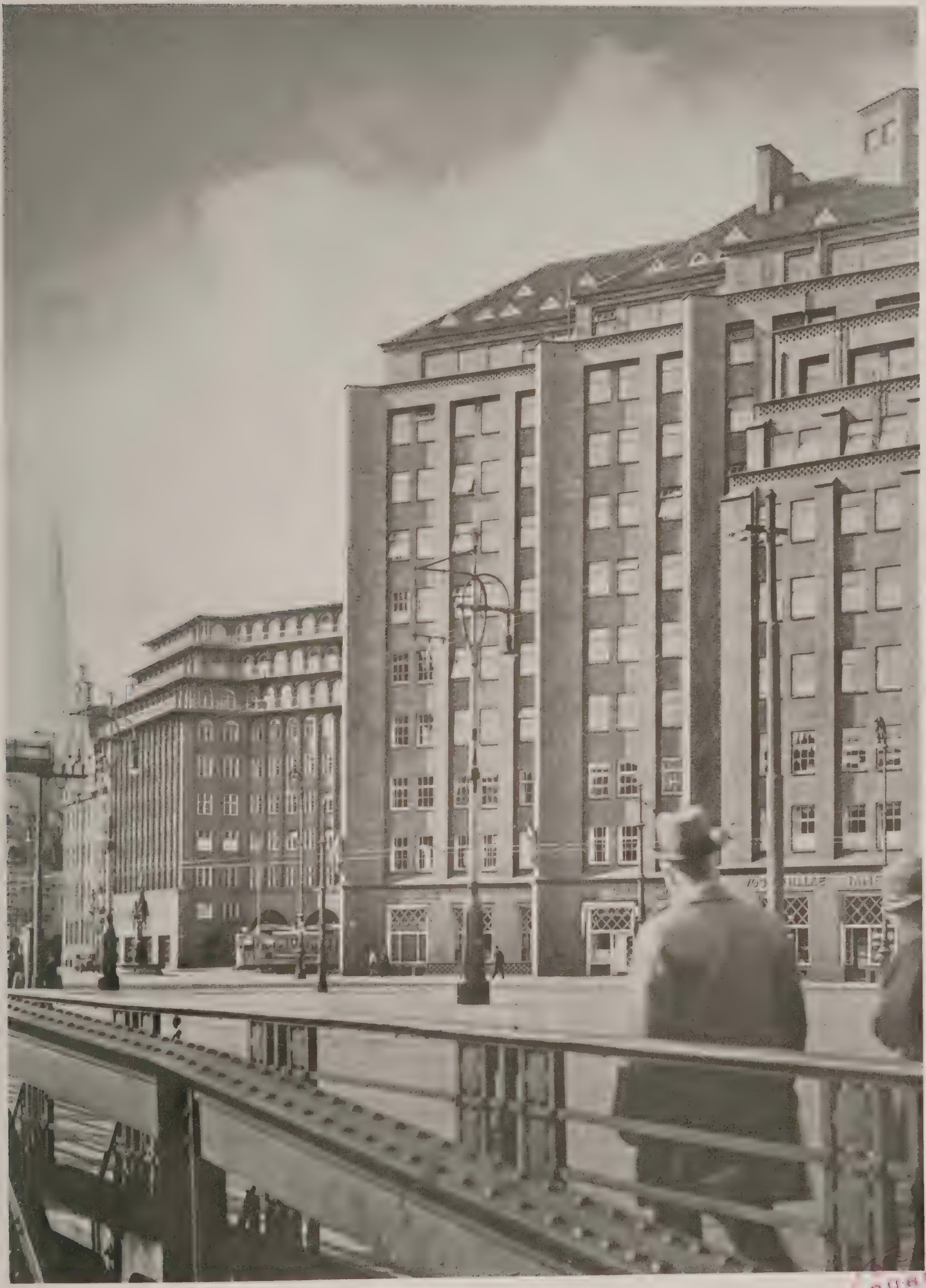

BALLINHAUS; CHILEHAUS IN BACKGROUND, HAMBURG
HANS OSKAR GERSON, ARCHITECT

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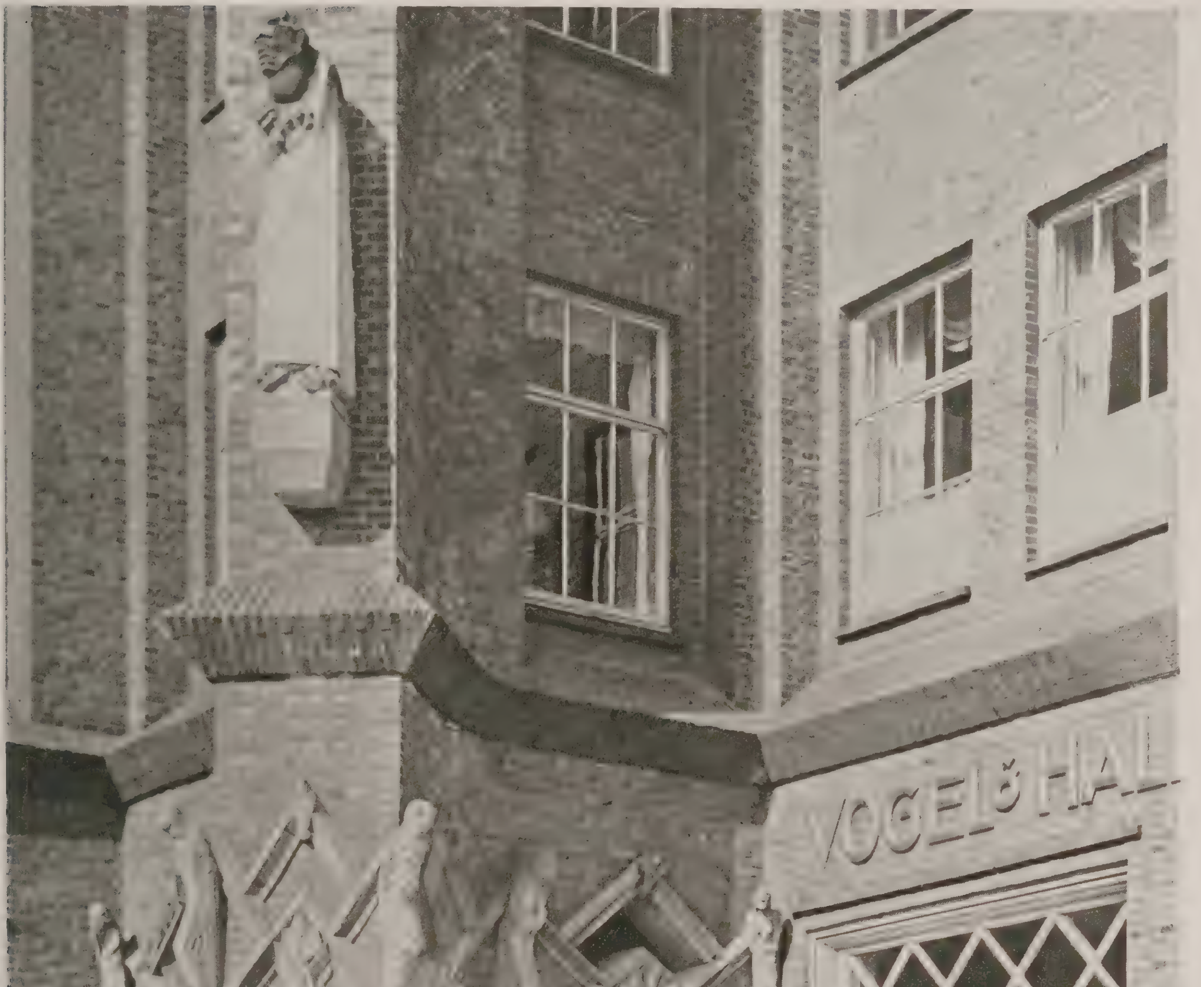

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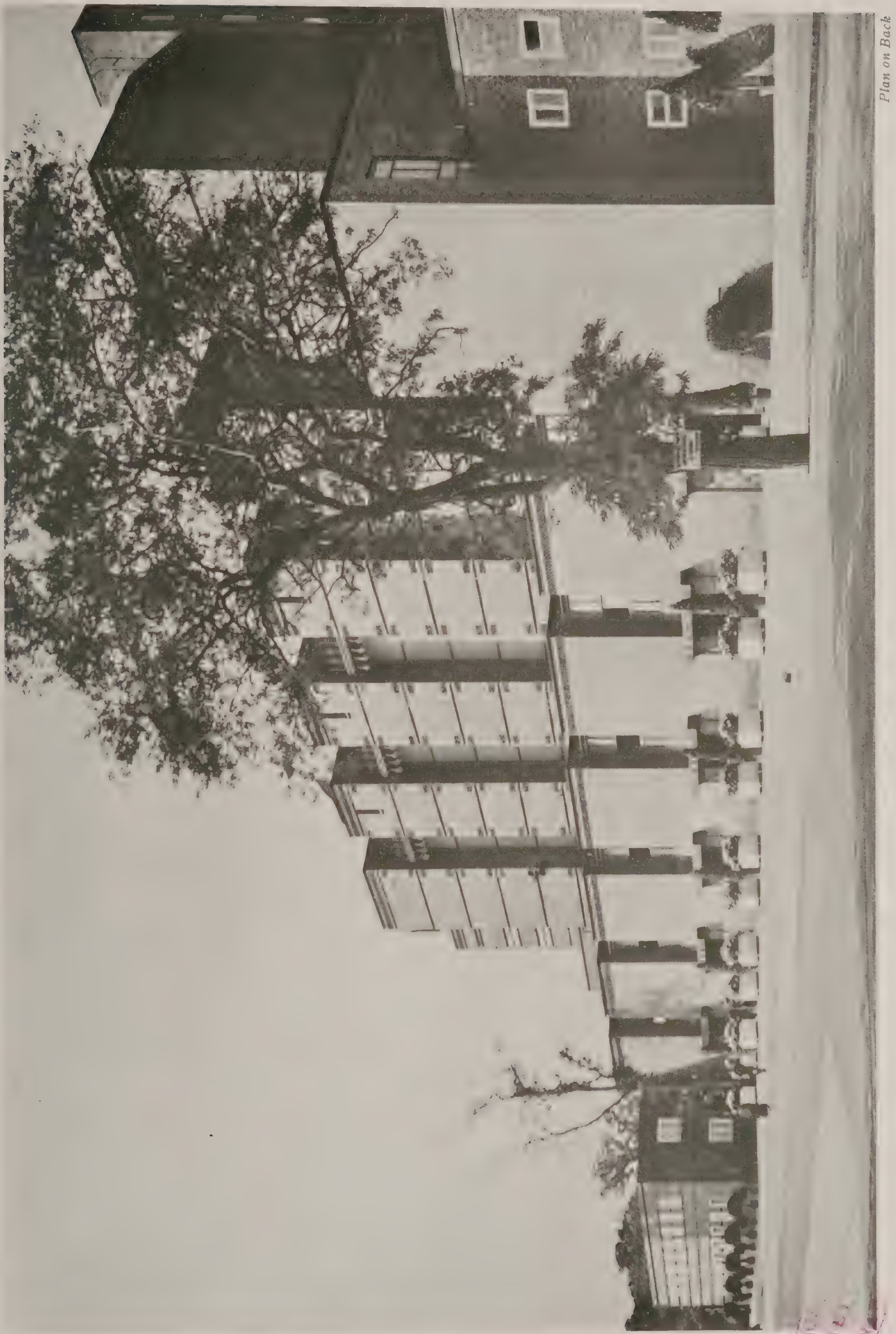
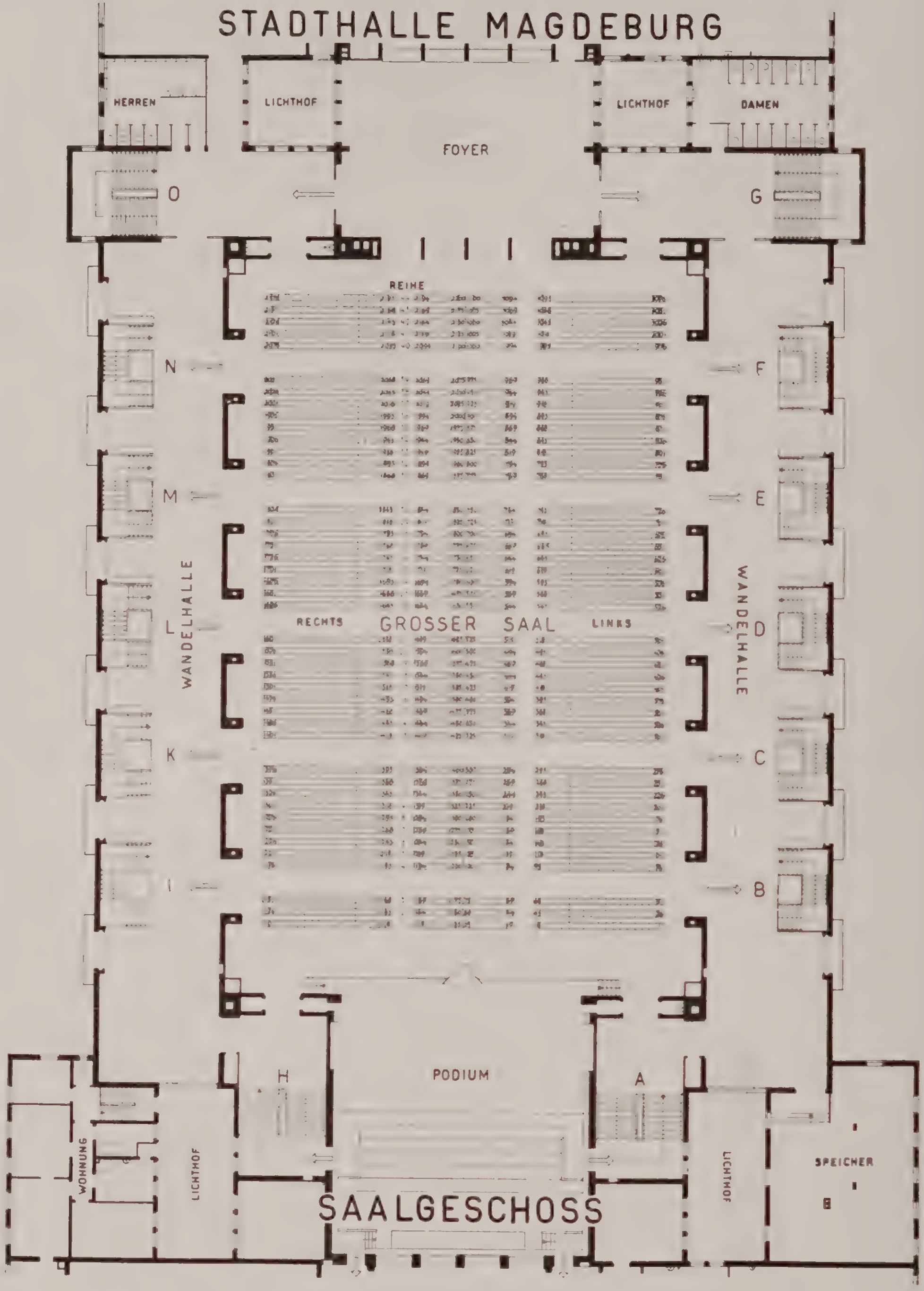
DOORWAY, BALLINHAUS, HAMBURG
HANS OSKAR GERSON, ARCHITECT



Plan on Back

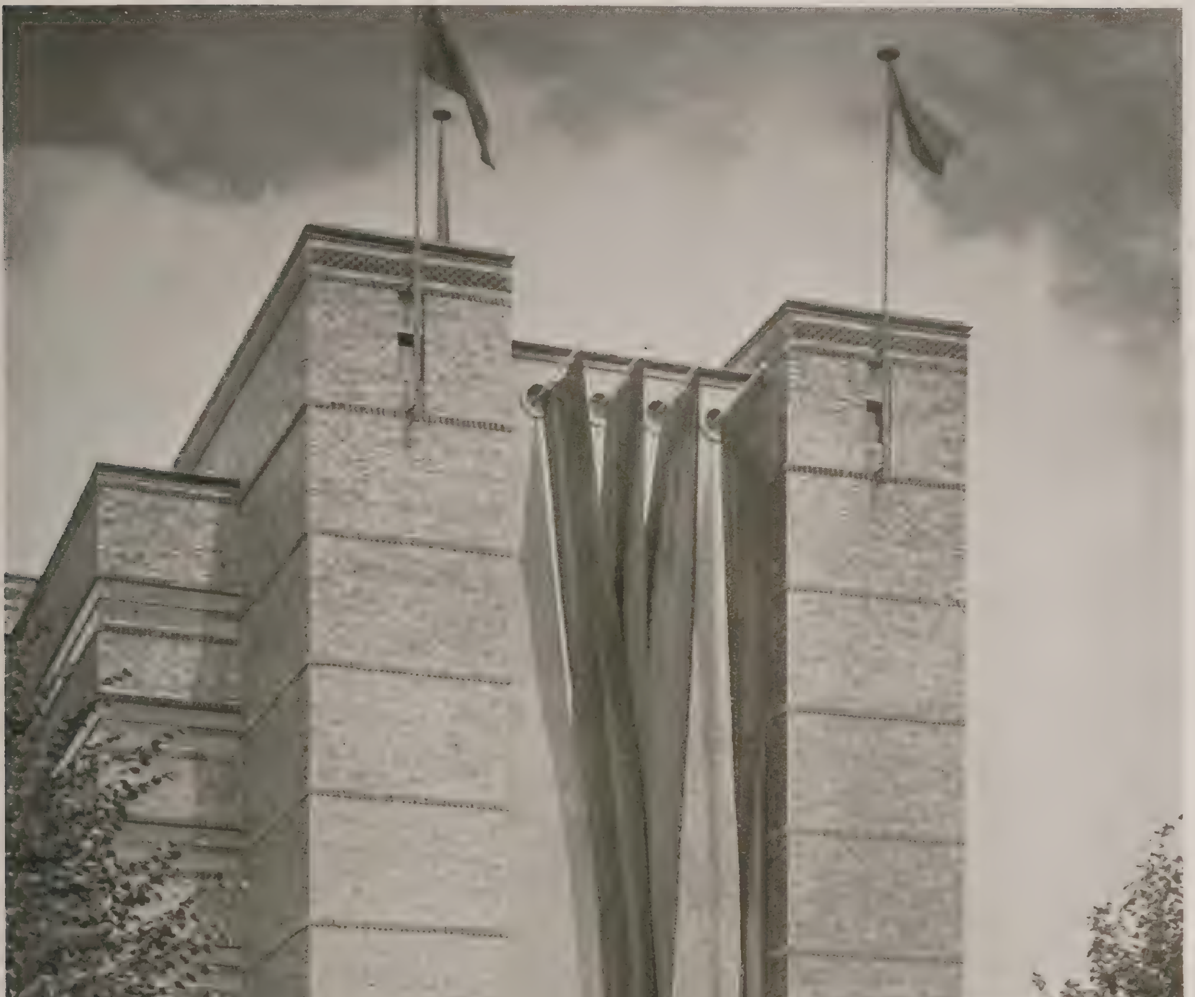
STADTHALLE, MAGDEBURG

JOHANNES GOEDERITZ, ARCHITECT



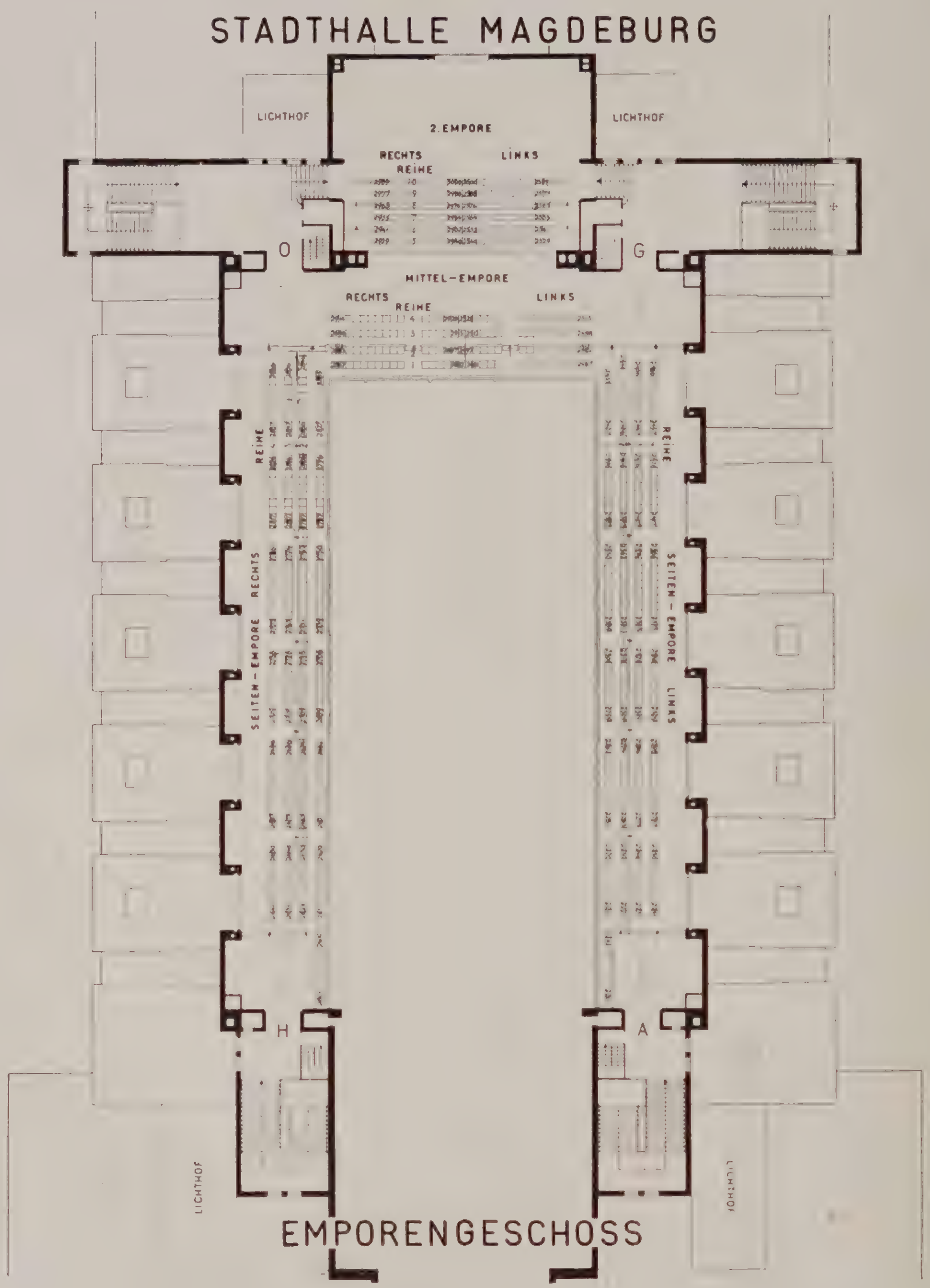
FIRST FLOOR

PLAN, STADTHALLE, MAGDEBURG
JOHANNES GOEDERITZ, ARCHITECT



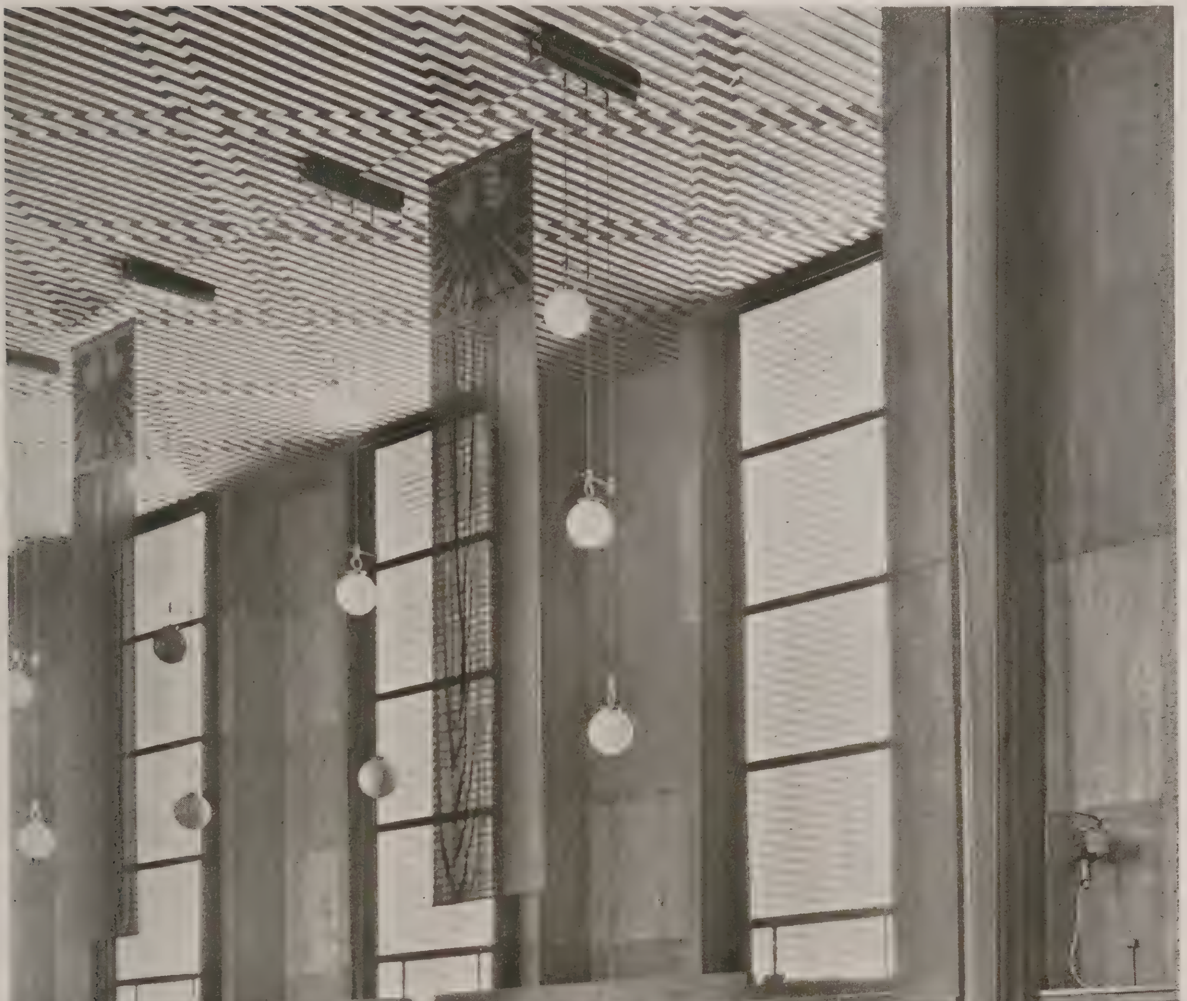
Plan und Bück

FRONT ELEVATION, STADTHALLE, MAGDEBURG
JOHANNES GOEDERITZ, ARCHITECT

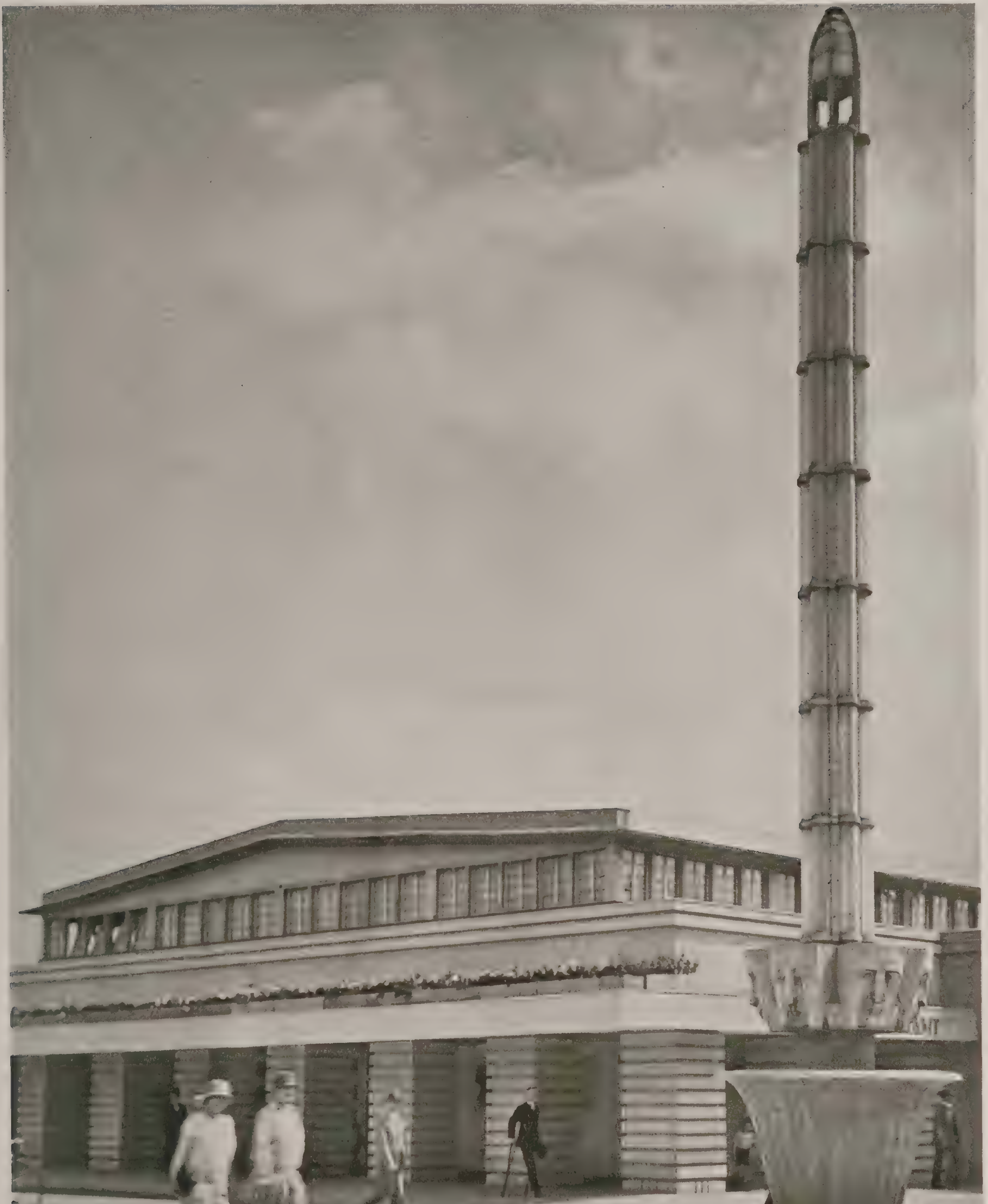


SECOND FLOOR

PLAN. STADTHALLE, MAGDEBURG
JOHANNES GOEDERITZ, ARCHITECT



AUDITORIUM, STADTHALLE, MAGDEBURG
JOHANNES GOEDERITZ, ARCHITECT



EXHIBITION PAVILION. STADTHALLE, MAGDEBURG
ALBIN MULLER, ARCHITECT

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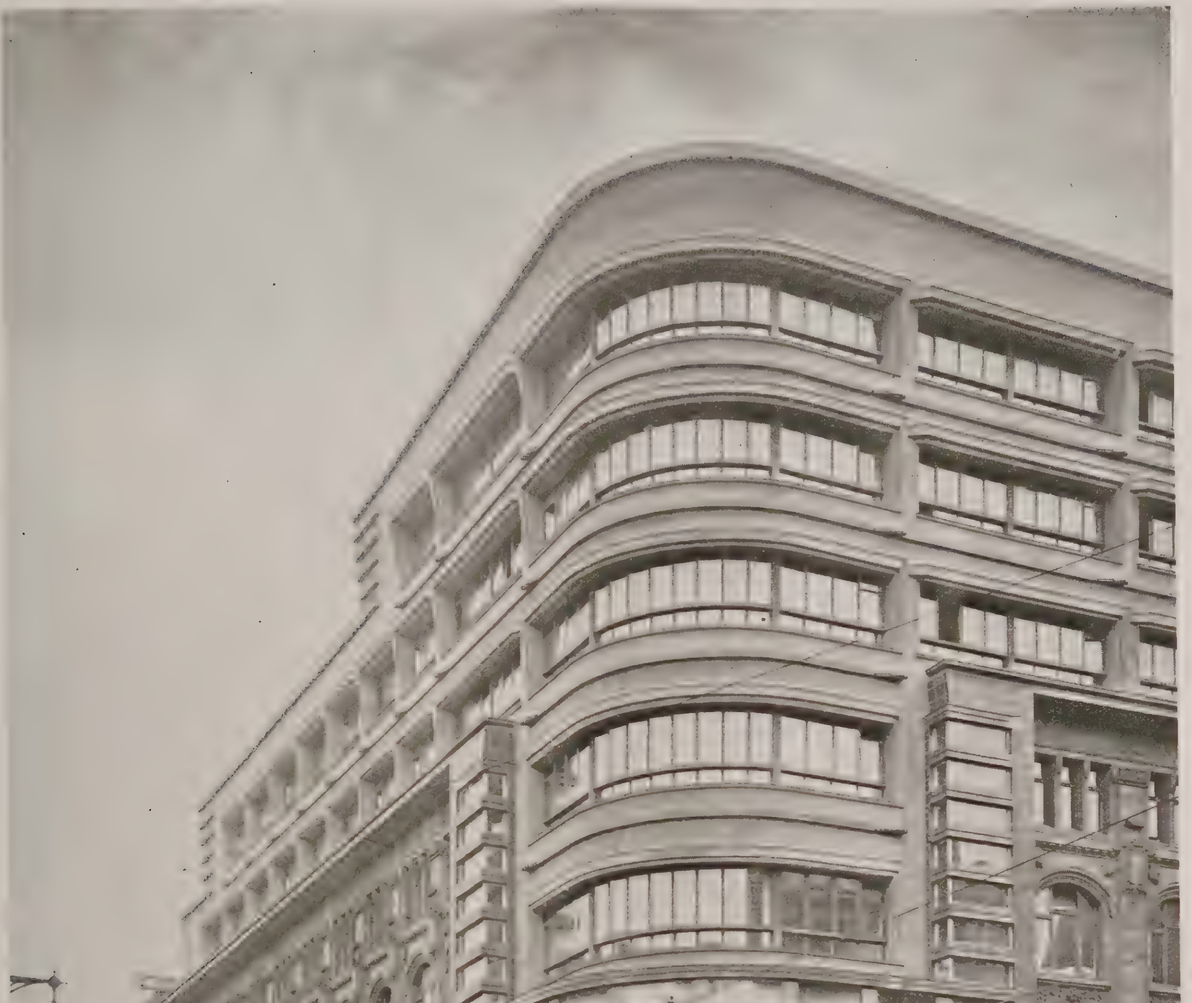
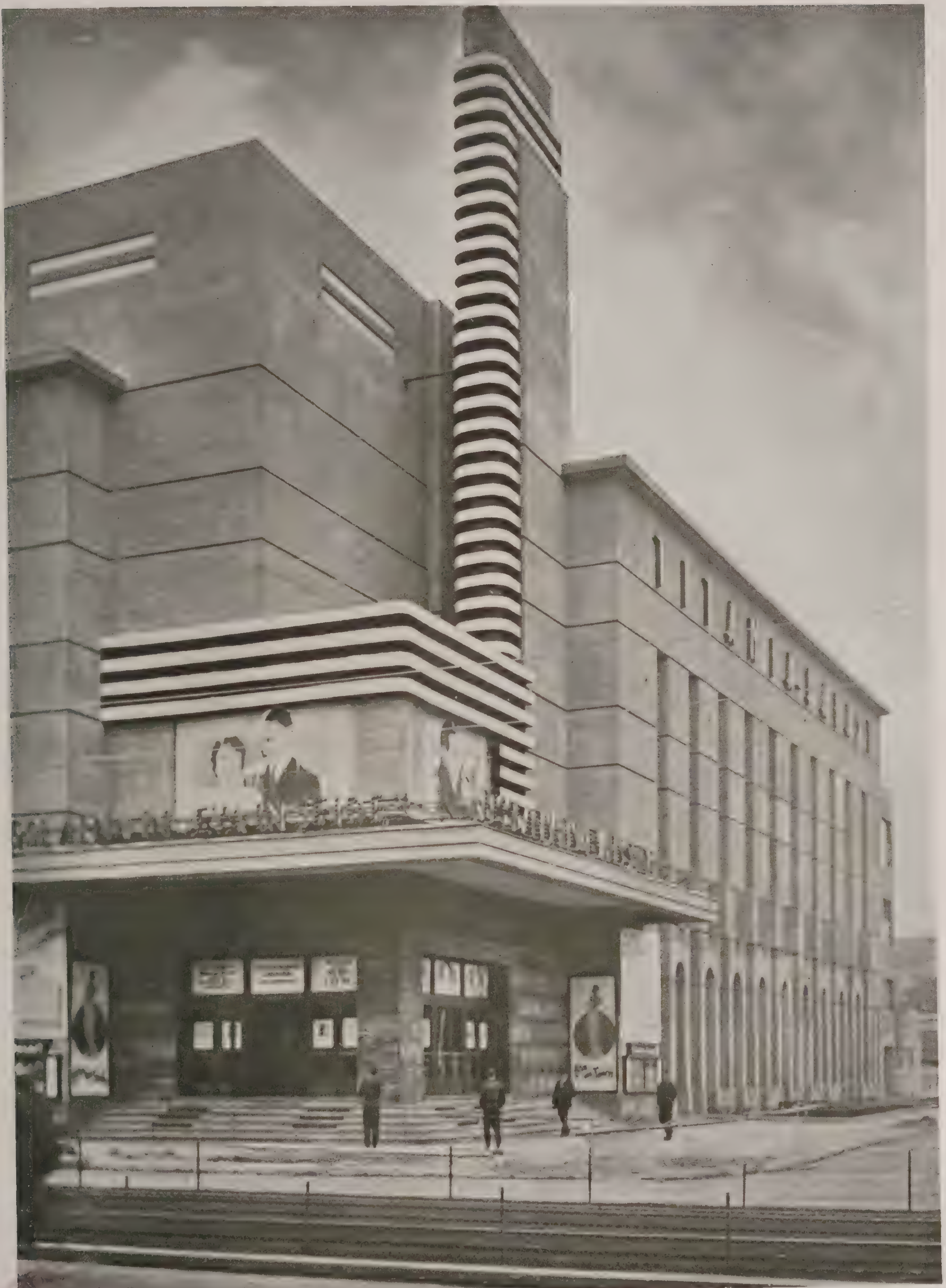
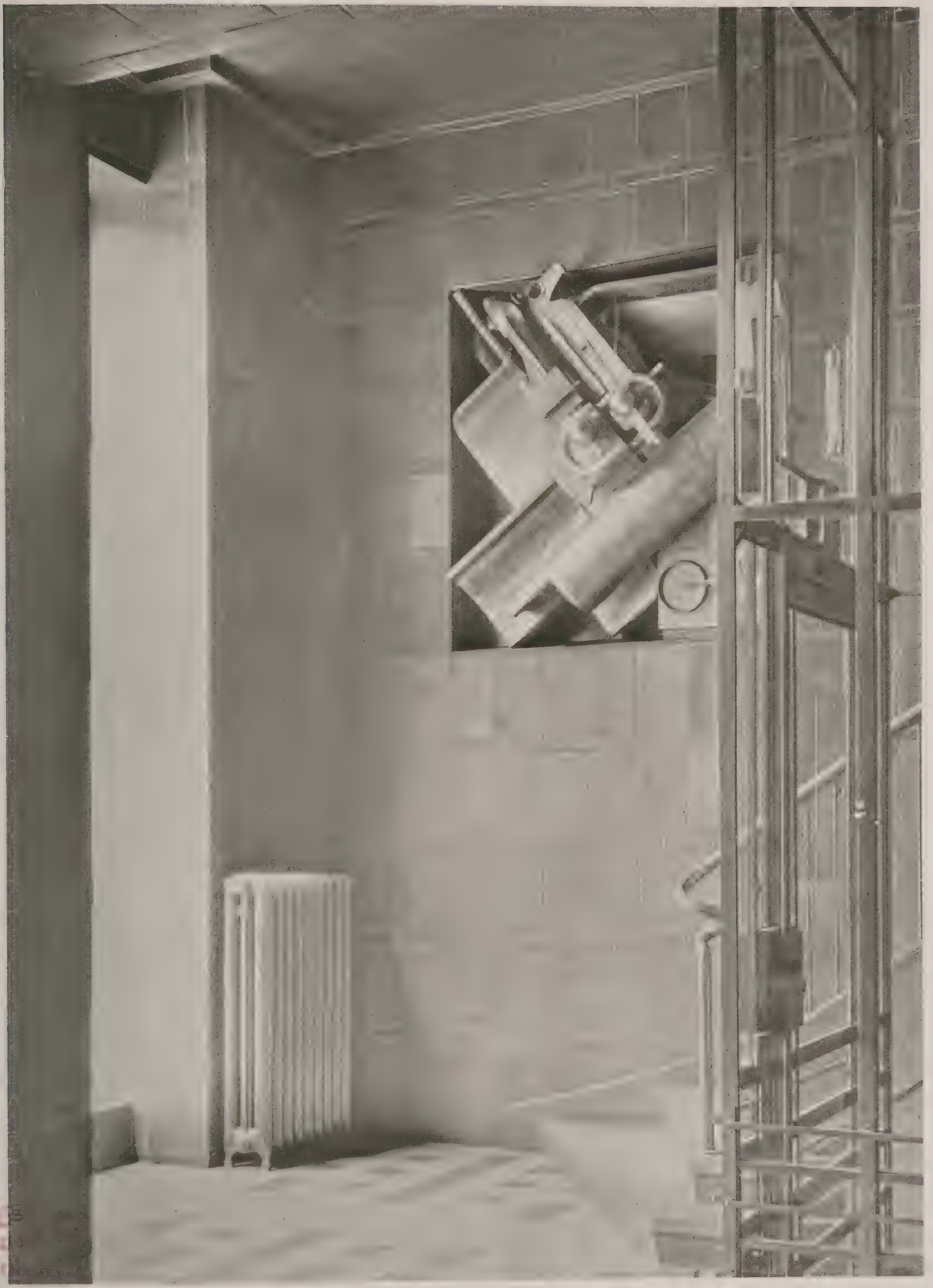


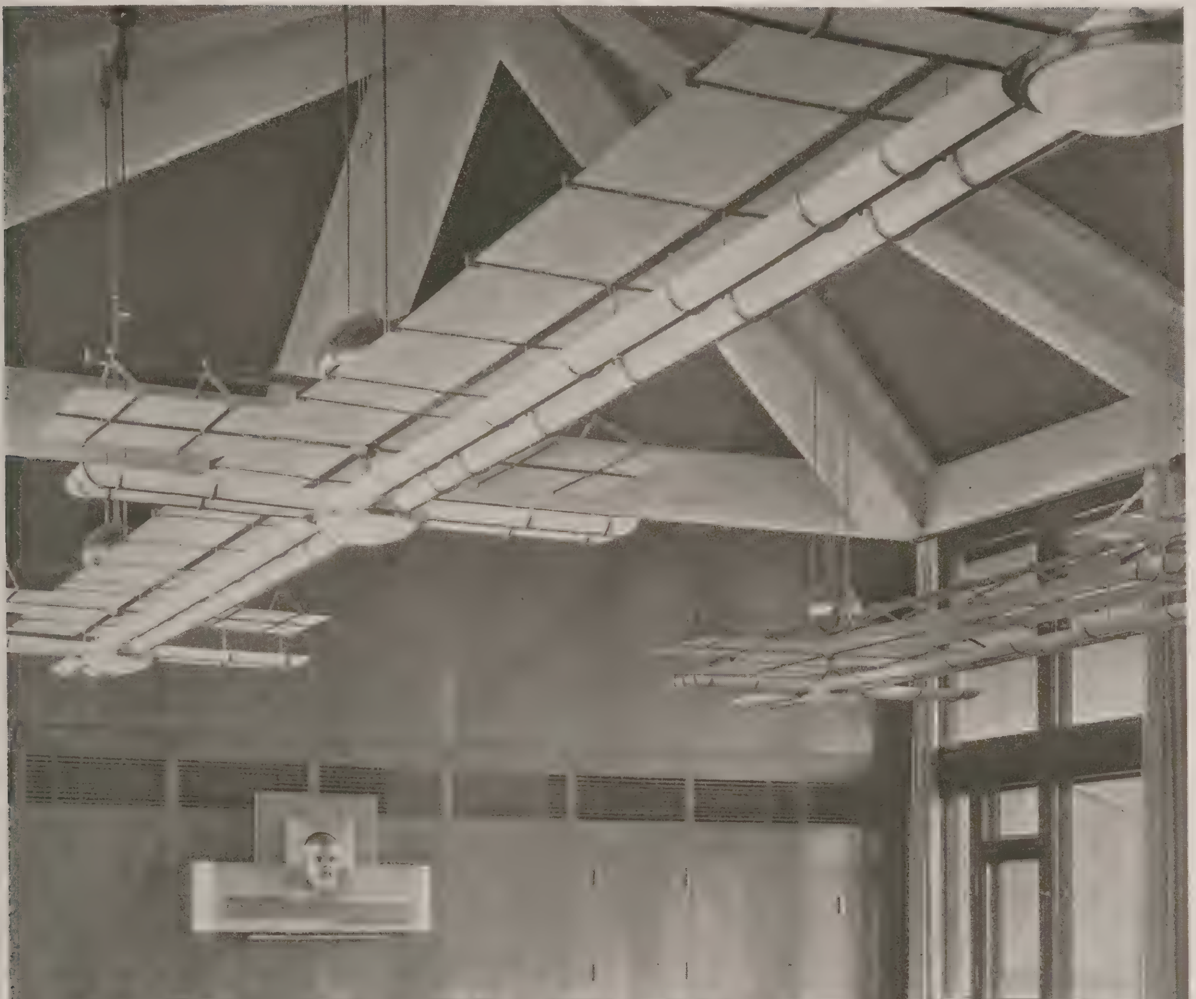
RUDOLF MOSSE BUILDING, BERLIN
ERIC MENDELSOHN, ARCHITECT



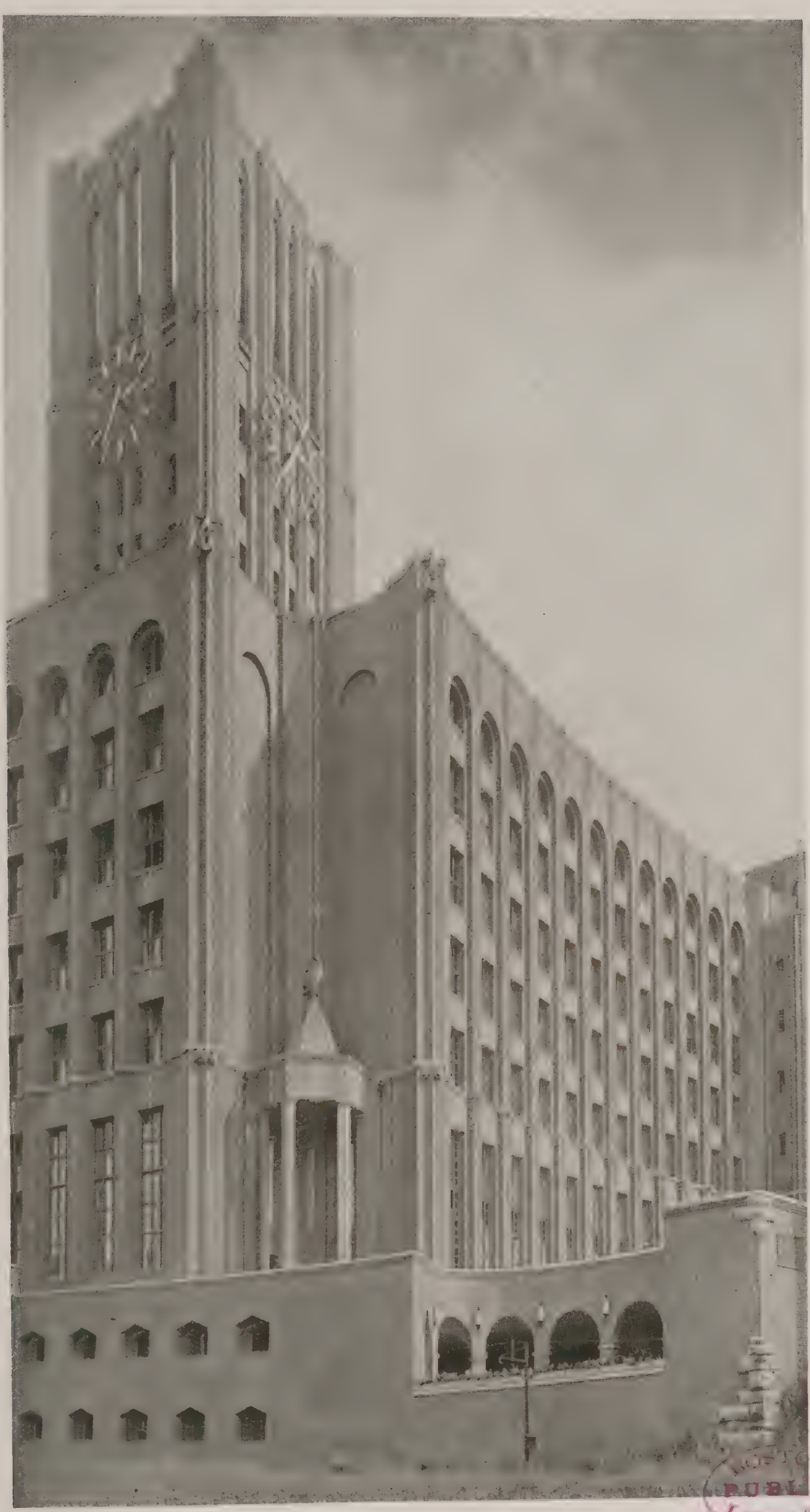
TITANIA MOTION PICTURE THEATER, BERLIN
SCHOFFLER, SCHONBACH & JACOBY, ARCHITECTS



AN INTERIOR. GERMAN BOOKPRINTERS' LABOR UNION BUILDING, BERLIN
MAX TAUT, ARCHITECT



BOARD ROOM. BOOKPRINTERS' LABOR UNION
MAX TAUT, ARCHITECT



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ULLSTEIN DRUCKHAUS, BERLIN
E. G. SCHMOHL, ARCHITECT

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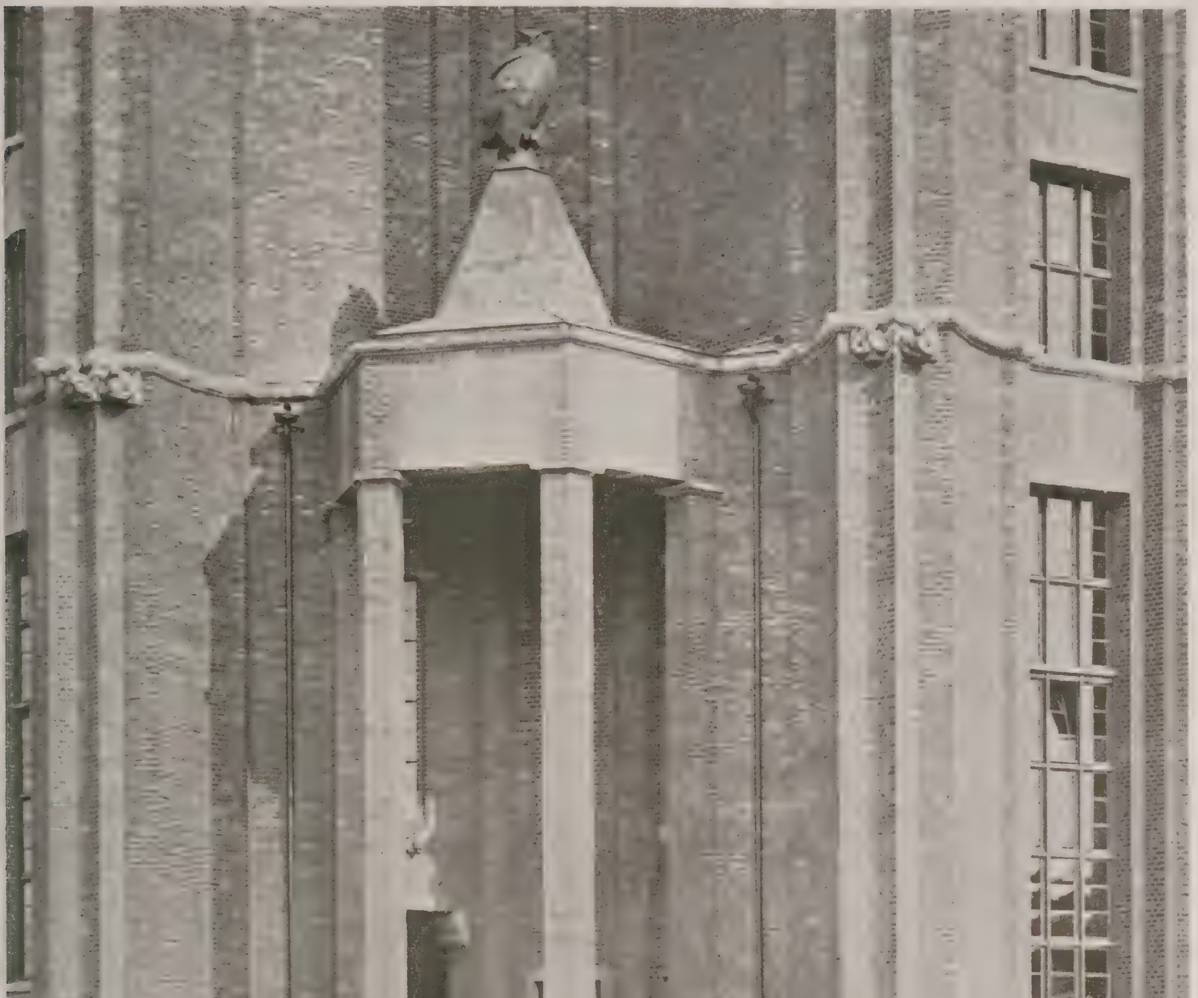
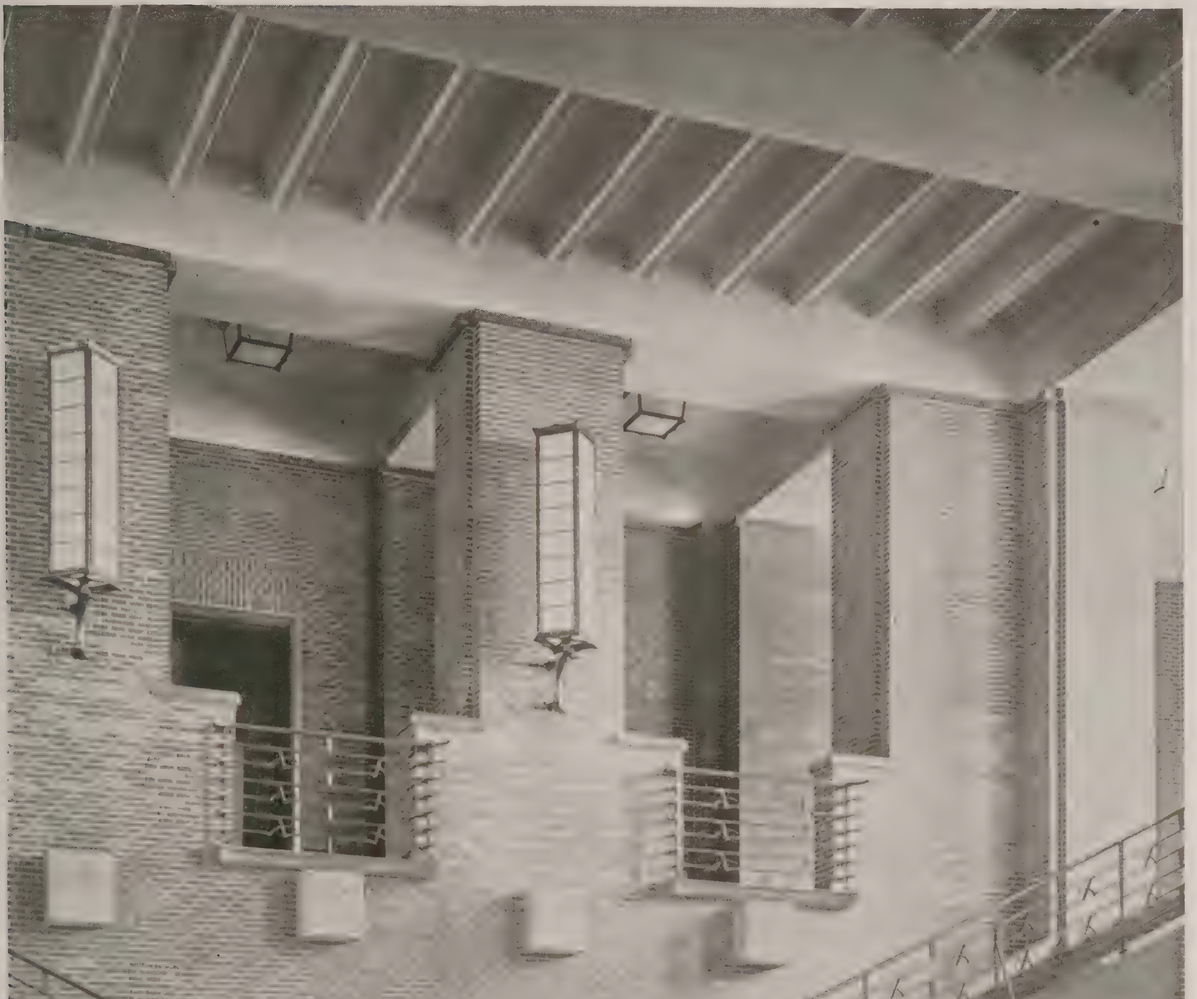


DETAIL. ULLSTEIN DRUCKHAUS, BERLIN
E. G. SCHMOHL, ARCHITECT



MAIN STAIRWAY, ULLSTEIN DRUCKHAUS
E. G. SCHMOHL, ARCHITECT

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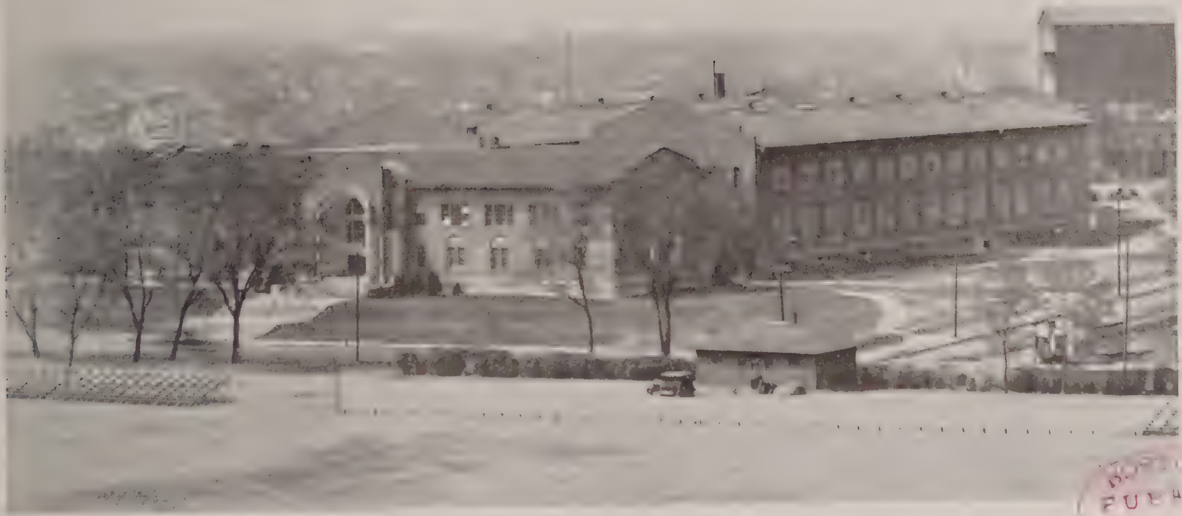
WILLIAM HOOD DUNWOODY INDUSTRIAL INSTITUTE, MINNEAPOLIS

HEWITT & BROWN, ARCHITECTS

BY
C. A. PROSSER

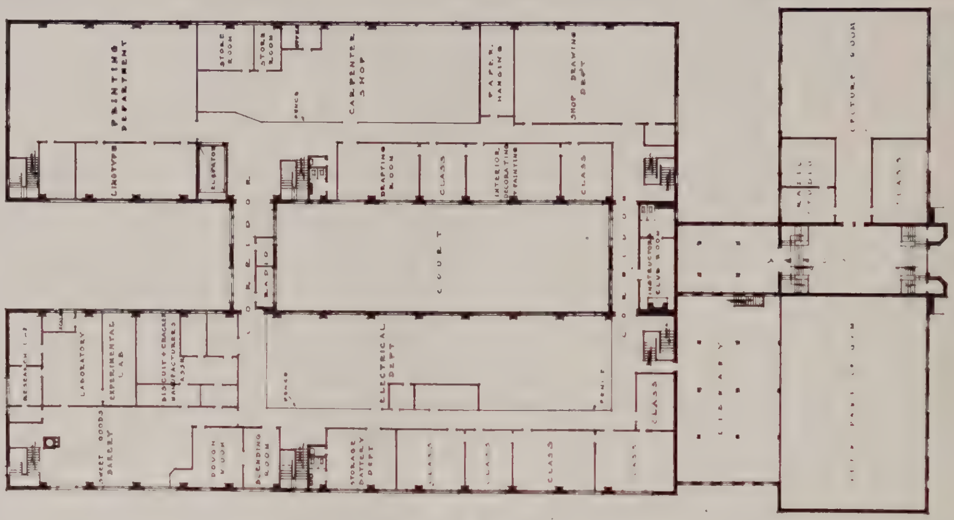
WHEN William Hood Dunwoody, a leading business man of the northwest, died, in 1914, he left the greater portion of his large fortune to found a new industrial and trade school. Upon her death, which soon followed, his wife, Kate L. Dunwoody, created a separate trust for the benefit of the new educational institution that bore her husband's name. Those who have studied it, regard his will creating an educational foundation for the William Hood Dunwoody Industrial Institute as a model instrument, particularly in its provisions for the organization and support of the school. Mr. Dunwoody instituted a self-perpetuating board of trustees, composed entirely of leading business men of Minneapolis with whom he had been closely associated, and he placed in their hands, subject only to a very few conditions, the full power to develop the school as they saw fit and as changing conditions might require. While the Institute was to be located in Minneapolis, training was to be free to residents of Minnesota and given without "distinction on account of race, color or religion."

By an understanding with the Minneapolis Board of Education, the vocational training of girls and women for industrial occupations was taken over by the public schools. As a result, Dunwoody Institute has, from the start, confined its service to males. In the exercise of their discretionary powers, the trustees construed the language of the will so as to serve men as well as youths. For three years the school was housed, through the generous coöperation of the Minneapolis Board of Education, in an old high school building which had been abandoned for regular school purposes. During this period, a site was purchased and two of the three buildings now occupied by the Institute were built. Starting in 1914 with 40 students and provision for training in four occupations, the school now serves about 5,000 students annually and gives instruction through full-time, part-time and evening classes in some 65 different kinds of employment, chief among which are the occupations required

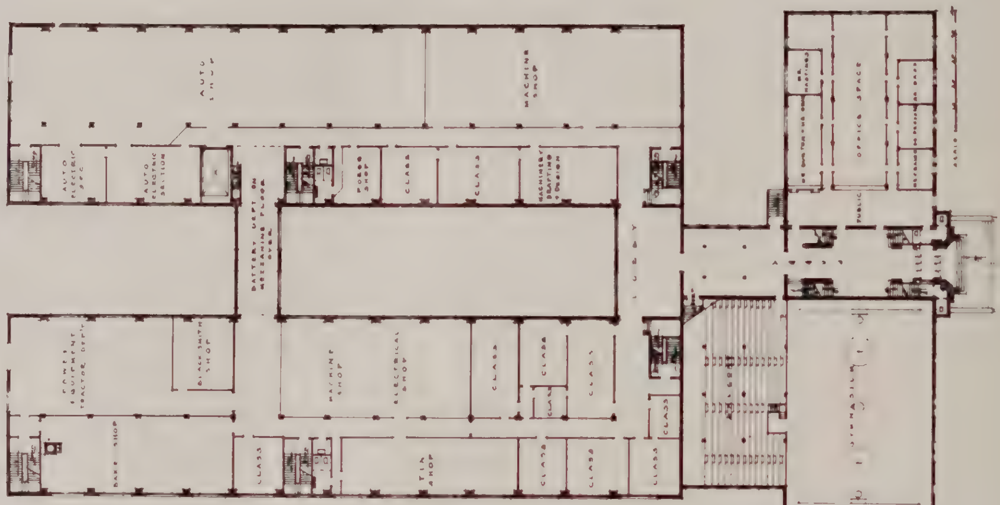


Photos. Hibbard Studio

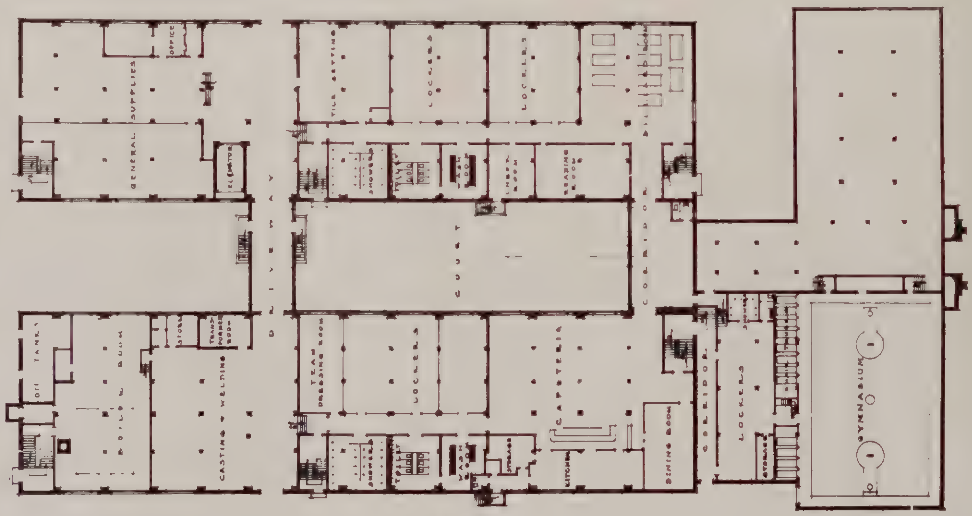
William Hood Dunwoody Industrial Institute, Minneapolis
Hewitt & Brown, Architects



SECOND FLOOR

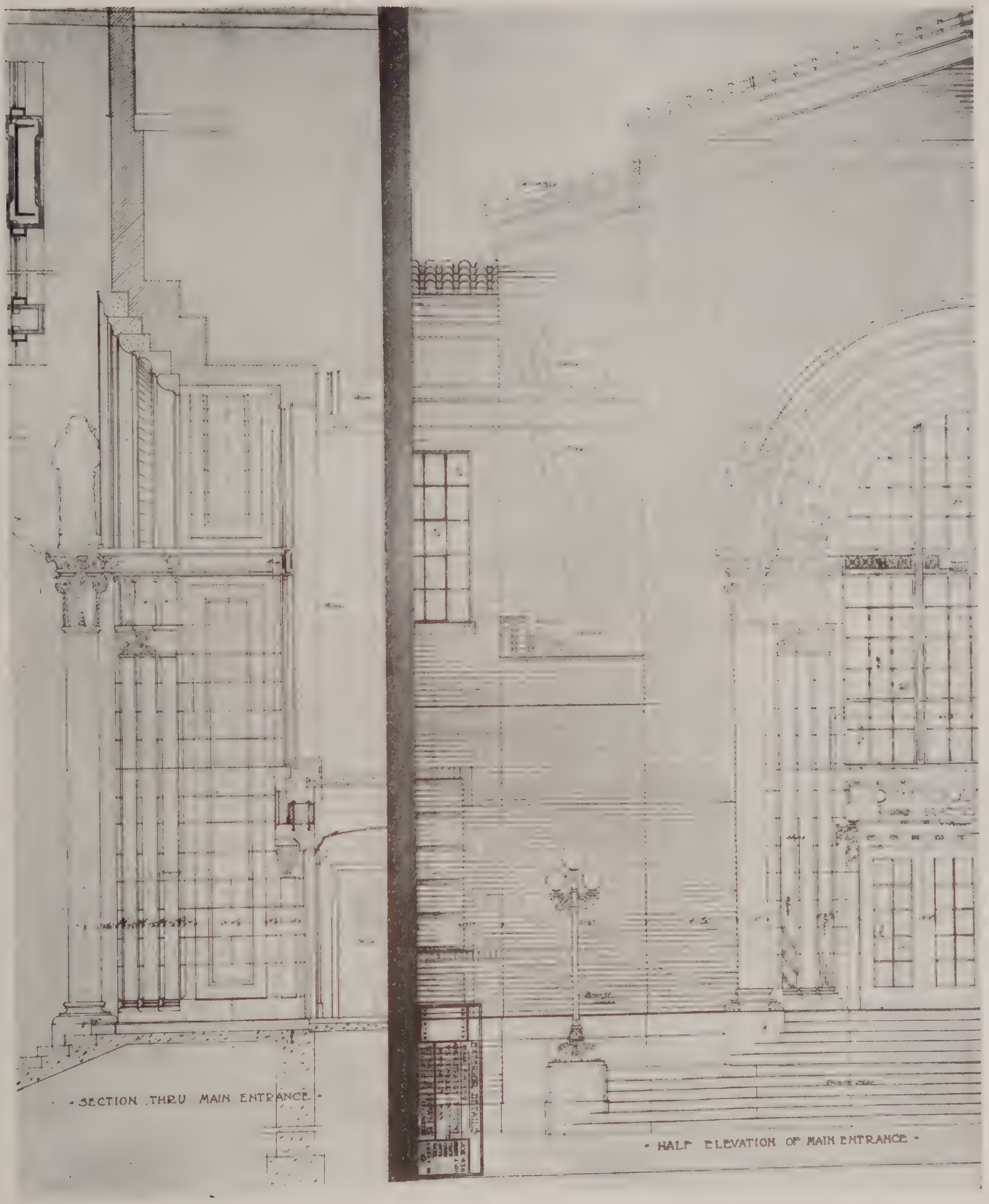


MAIN FLOOR



BASEMENT

PLANS. WILLIAM HOOD DUNWOODY INDUSTRIAL INSTITUTE, MINNEAPOLIS
HEWITT & BROWN, ARCHITECTS



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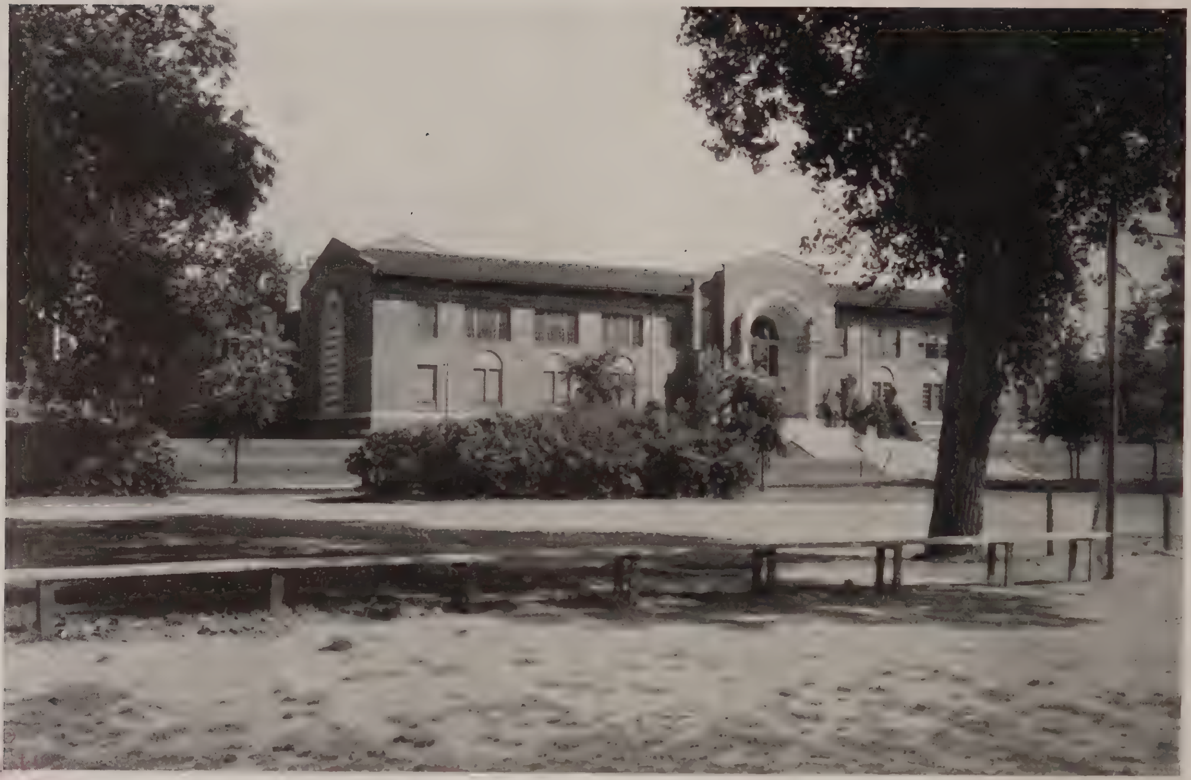

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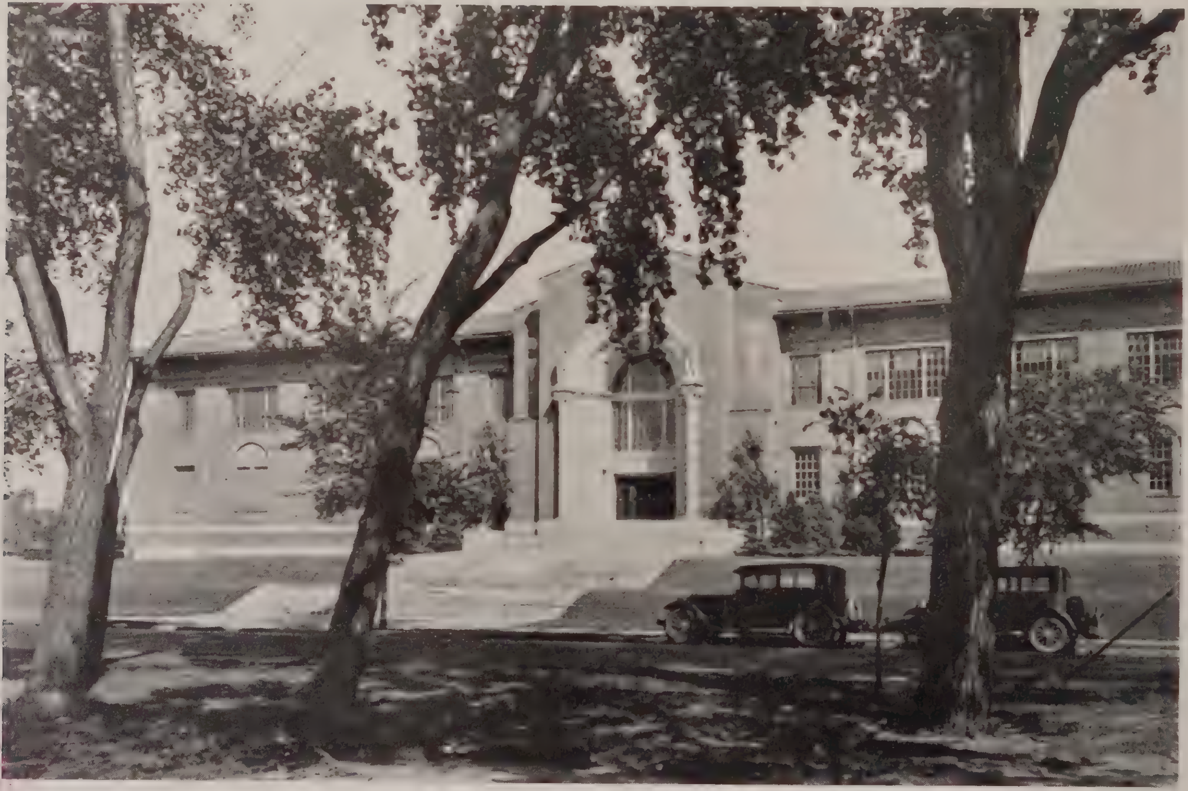
GENERAL VIEW



FRONT ELEVATION

WILLIAM HOOD DUNWOODY INDUSTRIAL INSTITUTE, MINNEAPOLIS

HEWITT & BROWN, ARCHITECTS

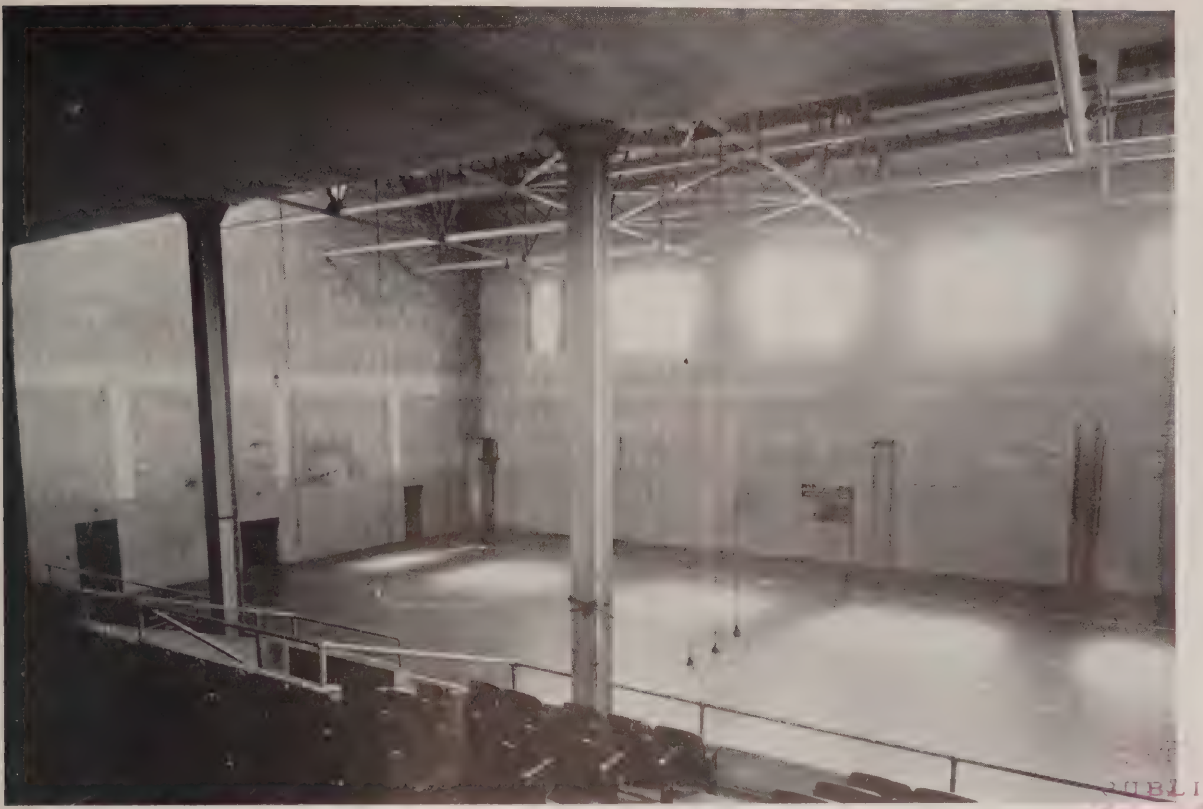


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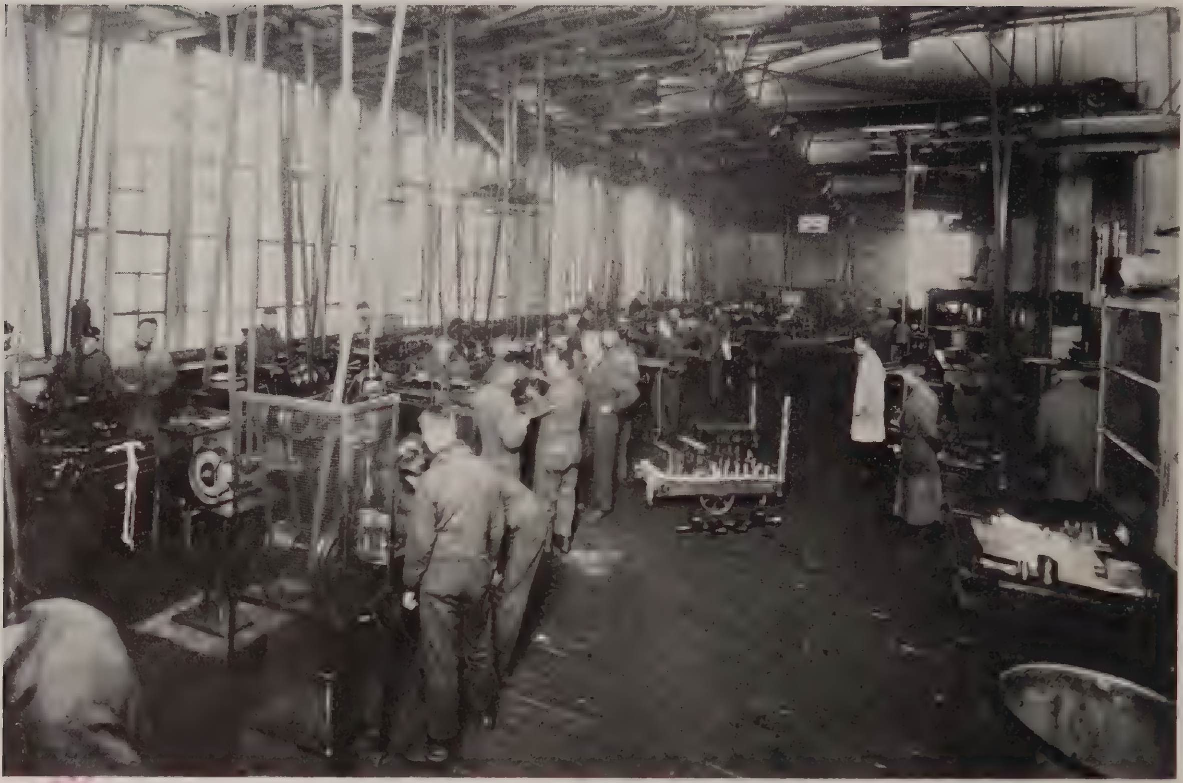
Photo. A. E. Kairies

Gymnasium. William Hood Dunwoody Industrial Institute, Minneapolis
Hewitt & Brown, Architects

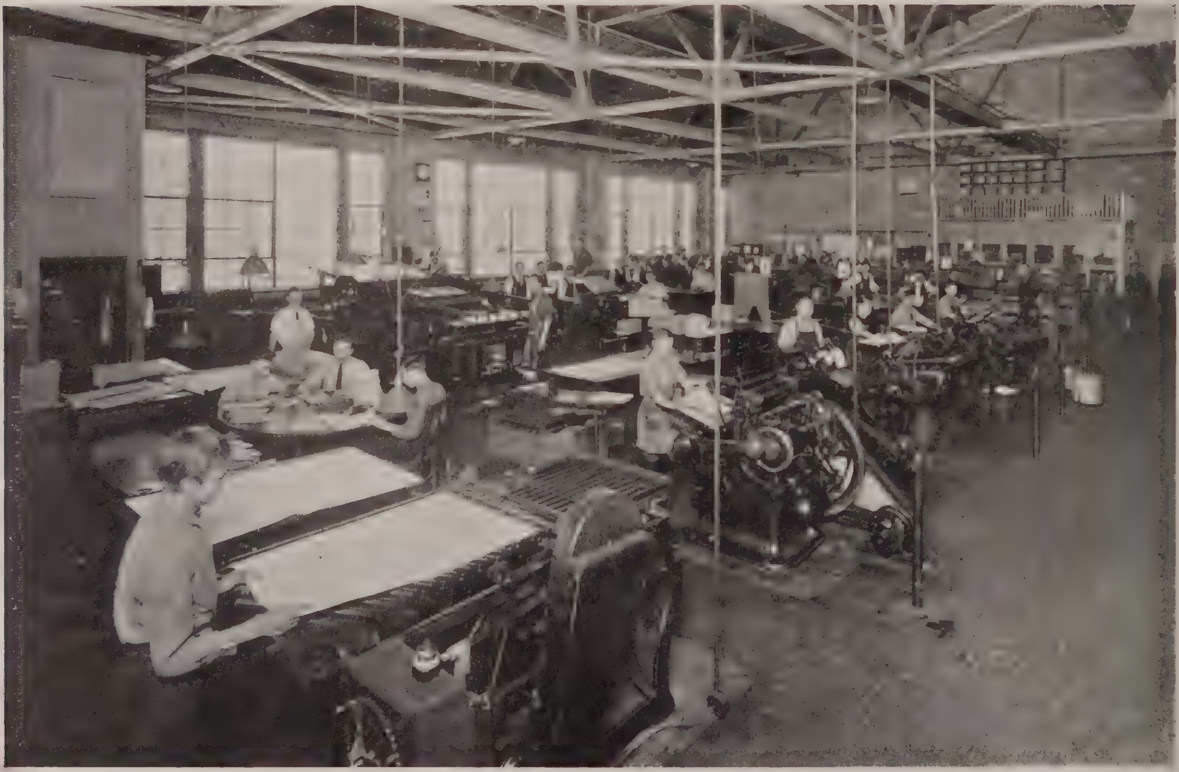
in such lines as automobile repair and operation, baking, building construction, architectural and mechanical drafting, printing, electrical work, machine shop work, sheet metal working, highway construction, farm mechanics, tile laying, railway mechanics, operation of tractors, and the duties of foremanship. In the 14 years since it has been established, the school has enrolled more than 48,000 civilians in its various classes, most of which are conducted in its own buildings, but many of which have been held in the manufacturing plants of coöperating concerns in the Twin Cities. In addition to this, more than 7,000 enlisted men were trained during the World War for special occupations in the army and the navy, making a total of more than 55,000 persons who have thus far been reached and helped by Mr. Dunwoody's benefaction. While the great bulk of this registration came from residents of Minnesota to whom tuition is free, an increasing number of non-resident students, who pay the actual cost of instruction, come from all parts of the United States and from many foreign countries to the schools which the Institute operates in the three lines of baking, printing and tile laying. So rapid has been the growth of the student body that the Institute reached five years ago the maximum attendance which the income from the endowment could be expected to provide for.

Shortly after the site was purchased, the trustees selected the firm of Hewitt & Brown as architects, and a year was spent by these architects, working in close contact with the officials of the Institute, in the development of plans for the buildings. In the purchase of the site, certain considerations were carefully safeguarded. Since the Institute was to be virtually the one center of industrial education for the community, it must be easy of access from every section. Accordingly selection was made of ground in the heart of the city, less than ten blocks from the loop district, less than three blocks from the main traveled car line, and facing a main traveled boulevard which separates it from the city's largest recreation park. Since ample space for known needs and for possible expansion must be provided, six plotted but unoccupied city blocks were purchased, the intersecting streets and alleys being closed by city ordinance and added to the tract. While this tract serves most admirably the purpose of the school, its nature was such as to make it poorly adapted for most uses; hence it was acquired at a low figure. Because the site was in some earlier period an old bed of the Mississippi River, a subterranean stream still flowing through, construction required considerable piling, the additional cost of which was more than offset by the advantages of the location and the unexpectedly small cost of the ground thus rendered available.

During this period, the architects and the di-



MACHINE SHOP

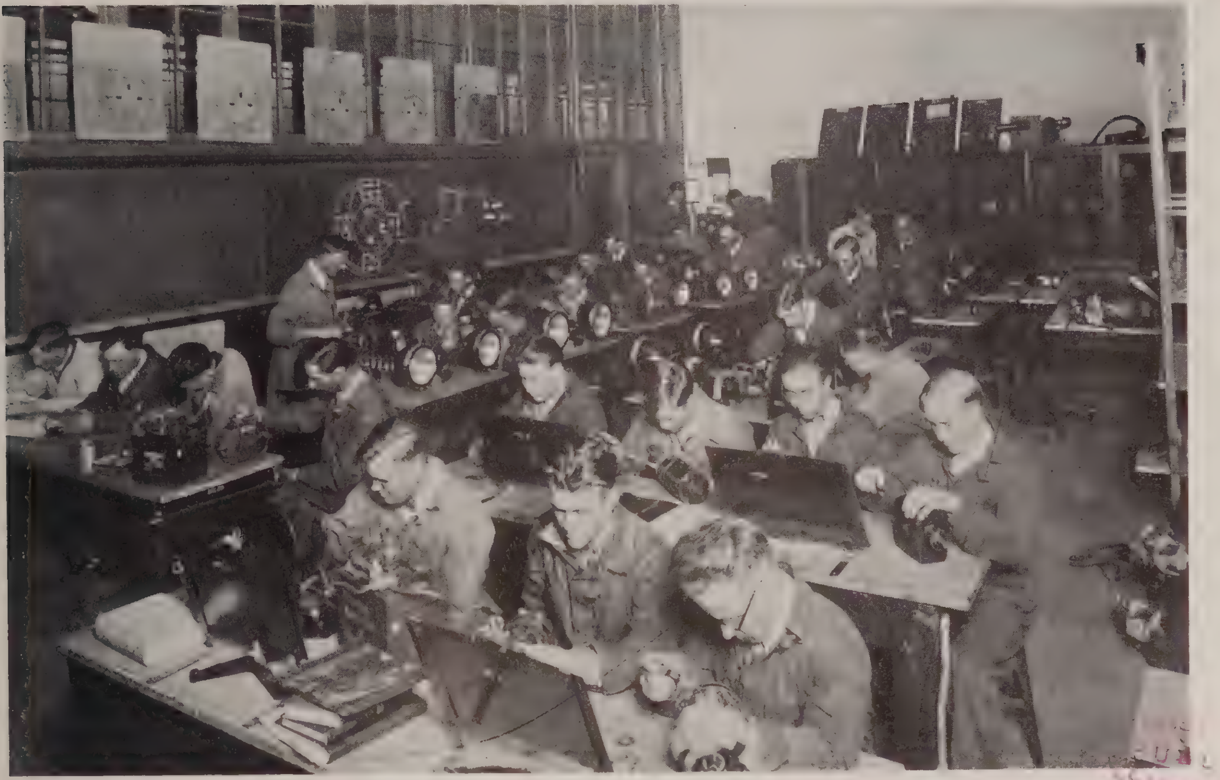


Photos. Hibbard Studio

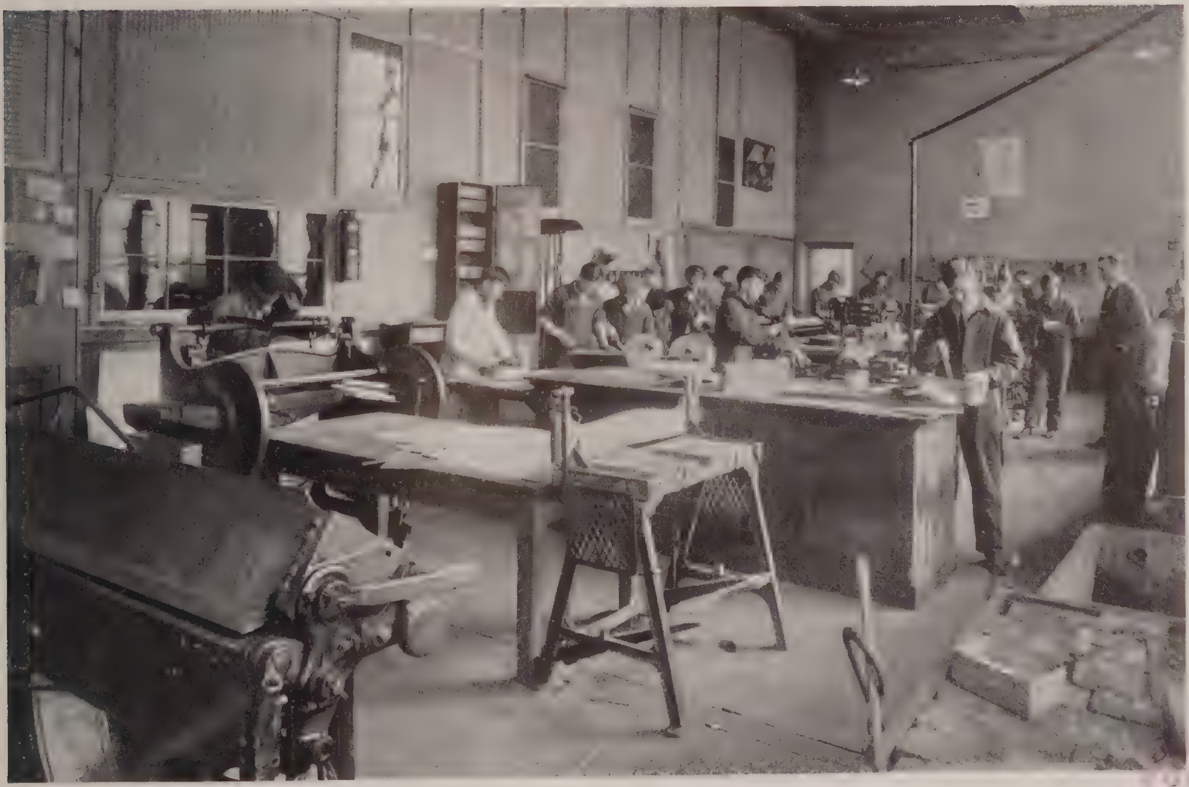
PRINTING DEPARTMENT

WILLIAM HOOD DUNWOODY INDUSTRIAL INSTITUTE, MINNEAPOLIS

HEWITT & BROWN, ARCHITECTS



AUTO ELECTRIC SHOP



SHEET METAL SHOP

WILLIAM HOOD DUNWOODY INDUSTRIAL INSTITUTE, MINNEAPOLIS

HEWITT & BROWN, ARCHITECTS

LIBRARY

Tile Setting Department. William Hood Dunwoody Industrial Institute, Minneapolis
Hewitt & Brown, Architects

rector and assistant director of the school visited virtually all of the larger of the industrial and trade schools which at that time had been established in this country, as well as the shops of a number of engineering and technical schools. From this visit a number of valuable ideas were gained, but they were confirmed in their belief that the plant for the Institute could not be modeled after that of any existing institution. Rather must it be adapted to the ideas of the authorities of the school regarding the kind of training which should be provided and the conditions under which the work must be done. Before any plan could be sketched it was necessary that the Dunwoody authorities should arrive at a meeting of minds regarding certain matters. In this they were helped to some extent by an industrial educational survey for Minneapolis which had been made in 1915 by the National Society for the Promotion of Industrial Education in coöperation with the Minneapolis Board of Education and the trustees of Dunwoody Institute. On the findings and recommendations of this survey the first work of the school was based. To this help should be added the experience gained in working with the problems while the school was housed in temporary quarters. Constantly the remarkable group of business men who composed the board of trustees brought to bear their ripened business experience. They had a deep interest in the task, were determined to make the school and keep the school true to the declared aims of its founder, and were soon "sold" on the ideas of national leaders as to what constituted real industrial training, which have since gained such widespread acceptance.

From all these conditions, there resulted certain very clear cut decisions on the basis of which the plans and specifications were drawn:

1. Although only two units were to be constructed, a comprehensive layout must be made which would fit them into the complete plan.

2. As the core of instruction in industrial education is the shop work where practice is given in the use of knowledge to get things done, these two building units should be primarily shop units, leaving to the future the problem of constructing a separate building for administrative offices and additional classrooms and other facilities. Seven years later this step was taken, but only after the growth of the school made it necessary. The trustees were then in a position to profit by experience and were provided with funds acquired by careful savings in their reserves to aid in financing the new construction.

3. Since industrial habits are best formed by actual practice on the kinds of problems on which the learner must use them in occupation, and in the kind of environment in which he is to use them for wage earning, these shops must in every

Electric Department. William Hood Dunwoody Industrial Institute, Minneapolis
Hewitt & Brown, Architects

respect be made as nearly like those of commercial plants as they can be made under a school roof. Accordingly these two buildling units are entirely of factory construction. On the day they were completed they consisted virtually of two substantial shells, each having a 9-foot basement and two stories, the floors being 285 feet long and 75 feet wide, with a height in the clear of 18 feet between beams and floor and lighted by large and almost continuous windows. On the interior they are precisely the kind of modern factory buildings to be found in any prosperous industrial district, and indeed they could readily be sold today and used for actual manufacturing purposes.

4. Since the effective training of anyone in doing anything requires a close tie-up between practice and theory, between knowledge and the use of that knowledge to get something done, the classroom work of the school should teach mathematics, drawing, science and trade practice as applied to the trade. In order to do this properly these classes should be held either in the shop itself or in rooms close by. Because each trade has its own body of facts and ideas which pertain specially to that trade, each trade taught by the Institute should be a unit designed to serve those engaged in learning something about some occupation in that trade. Accordingly, the building units are so constructed as to give each trade a distinct home where all the forms of shop and class work bearing on that trade are centered. By the simple policy of erecting movable partitions instead of immovable walls, there were set up within the space classrooms for each trade, opposite the shop floor, and these partitions have been shifted many times to meet changing conditions.

5. Since the instruction was to be practical fitting for bread winning, such buildings should be simple and not ornate, and should be kept so. Construction should be substantial and meet every demand for use. Equipment should be such as would give real trade experience and should not be allowed to become obsolete. On these two requirements emphasis must be laid in the expenditure of the funds of such an institution. The resources of any endowment must be husbanded because of the application to them of the adage "you cannot eat your cake and then have it." Not only did considerations of rational economy forbid elaboration in these buildings, for it was due to considering the eternal fitness of things as well. Training mechanics to work in marble halls violates reason and good taste. All these buildings, as a result, show from the exterior precisely what they are. They are places of service to those who desire to fit themselves for doing the kinds of things they must do all the days of their lives. Careful attention has been given to perspective and balance. Straight lines are employed instead of curves. Inexpensive but carefully kept lawns

and shrubbery give an attractive setting. On the interior, plain tables and stout chairs take the place of the traditional school room equipment, while the shops are but little more furnished than those of an enterprising commercial concern. Only the entrance to the new administration building provides anything in the nature of what might be called special decoration. There an attractive arch suggests by symbolic figures the principal trades which the school serves, and suggests the necessity that the successful mechanic should combine in his work both knowledge and skill. Any passer-by can see at a glance that here is a shop which is not all shop,—a school which is not all school in the ordinary sense of that word.

6. If the school is to be efficient and is to realize its full possibilities, it must be free to deal with its problems as they arise. Among other considerations, it must not be hampered by physical conditions. The plant, to illustrate, must be of ready access from main traveled thoroughfares and yet be so set within the grounds as to be protected on every side from outside noise, and from interference with light and air from any source. Not only must the grounds be extensive enough for these ends but they must also provide for the future expansion of the Institute as well as afford facilities for athletics, for adequate parking areas to accommodate the maximum number of cars used by instructors and by students, particularly by evening school men. And a spur track through the grounds to oil tank and stock room must facilitate shipments and reduce the cost of the extensive supplies which a school must use when it operates productive shops in order to insure actual trade training.

7. Without doubt, the greatest attention was paid to the need for flexibility. Industrial conditions change frequently, and if the Institute is to meet the real needs of workmen, it must be free constantly to adapt and re-adapt itself to the changing situation. New trades and occupations are continually arising and older trades disappearing, while others are being profoundly modified in their processes. The plant of the school must therefore facilitate and not hamper the effort to adjust itself continually to demands.

It will be impossible to point out here more than a few illustrations of the extent to which this necessity was safeguarded. By making the load-carrying power between beams practically the same at all points on all floors, it is possible to provide for use of almost any kind of equipment at any place, thus making all parts of the building equally available for any kind of training and making it possible to shift any trade to new quarters when conditions require. By installing at the time the building was erected and at regular intervals of about 20 feet facilities for using gas, electricity, water, compressed air and drainage, these services are ready to be tapped and used at convenient points for every conceivable kind of training the Institute might see fit to undertake.

8. By placing at accurate intervals in all cement ceilings stout rings which are readily uncovered and easily utilized, it is no trouble to hang overhead shafting in new places and to supply for any purpose overhead support for anything desired. Attention has already been called to the use of movable partitions. Separated from one another down the long stretch of open floor only by wire fencing easily moved, the shops of the various trades can readily be collapsed or expanded according to the demands which the enrollment makes upon them, and so readily that this is often done on Saturdays so as to present on Monday morning quite a different allocation of floor space.

Many of the features described here contributed to the comparatively low cost at which the plant was constructed. For the shop units erected in 1916-17, this cost was roughly 19 cents per cubic foot when the cost of construction for similar purposes by other institutions with which the writer is familiar ranged during the same period around 27 cents. This statement is not made in any boasting spirit. Mistakes have been made, and doubtless there are others of which those in charge should be aware. Taken as a whole, however, these are of comparatively small importance contrasted with advantages which have been gained.

From the standpoint of the school man, there are certain convictions which may be worth expressing in closing,—convictions at which the writer has arrived regarding sound procedures to be followed in the construction of any building for any educational purpose, particularly if it be some special purpose such as industrial or trade education. Among these convictions, to mention a few:

1. The responsible school authorities should first arrive at a meeting of minds concerning the kind of service they desire to render in the proposed building.

2. All the helpful experience of others should be collected and brought to bear in planning the service to be performed and the building in which it is to be rendered.

3. The building should be looked upon simply as a device,—a tool to be used in rendering this service efficiently.

4. Every feature of the structure should be planned from the standpoint of the purpose for which the building is to be used.

5. There should be recognition of the changing conditions to which the service must constantly be adapted.

6. Since these changes cannot be forecasted or anticipated, the building should be originally constructed to give the greatest possible flexibility.

MODERN FURNITURE AND DECORATION

DESIGNED BY HERBERT LIPPMANN, ARCHITECT

BY PARKER MORSE HOOPER

FOR three months during the late winter and early spring of this year record crowds visited the First Exhibition of Contemporary American Industrial Art at the Metropolitan Museum. From the point of view of design, the outstanding fact about this exhibition was that all of the several rooms were conceived and designed by and executed under the supervision of several of the leading younger architects who are particularly interested in modern design. Had the space devoted to this exhibition at the Metroplitan Museum been greater, there is no doubt but that Herbert Lippmann, another one of the younger architects interested in modern design, would have been represented.

THE ARCHITECTURAL FORUM considers it a privilege to publish the accompanying illustrations which clearly show Mr. Lippmann's ability in designing and arranging modern furniture in an attractive and homelike manner. It has often been said that the rather angular and sometimes austere character of modern furniture does not adapt itself well to domestic interiors. After studying these illustrations of modern furniture and decorations by Mr. Lippmann, it is possible to appreciate the fact that contemporary furniture, if designed with a thought for comfort and convenience as well as simplicity and style, can be successfully used in American homes. Just as the modern style of architectural decoration seems particularly fitting for shops, stores, clubs, restaurants, theaters and hotels,—in other words, for many types of places used by or pertaining to the public,—so also it may be successfully used in city homes, either apartments or houses. The rather severe and formal character of most modern furniture makes it perhaps more appropriate and suitable for urban than for country homes.

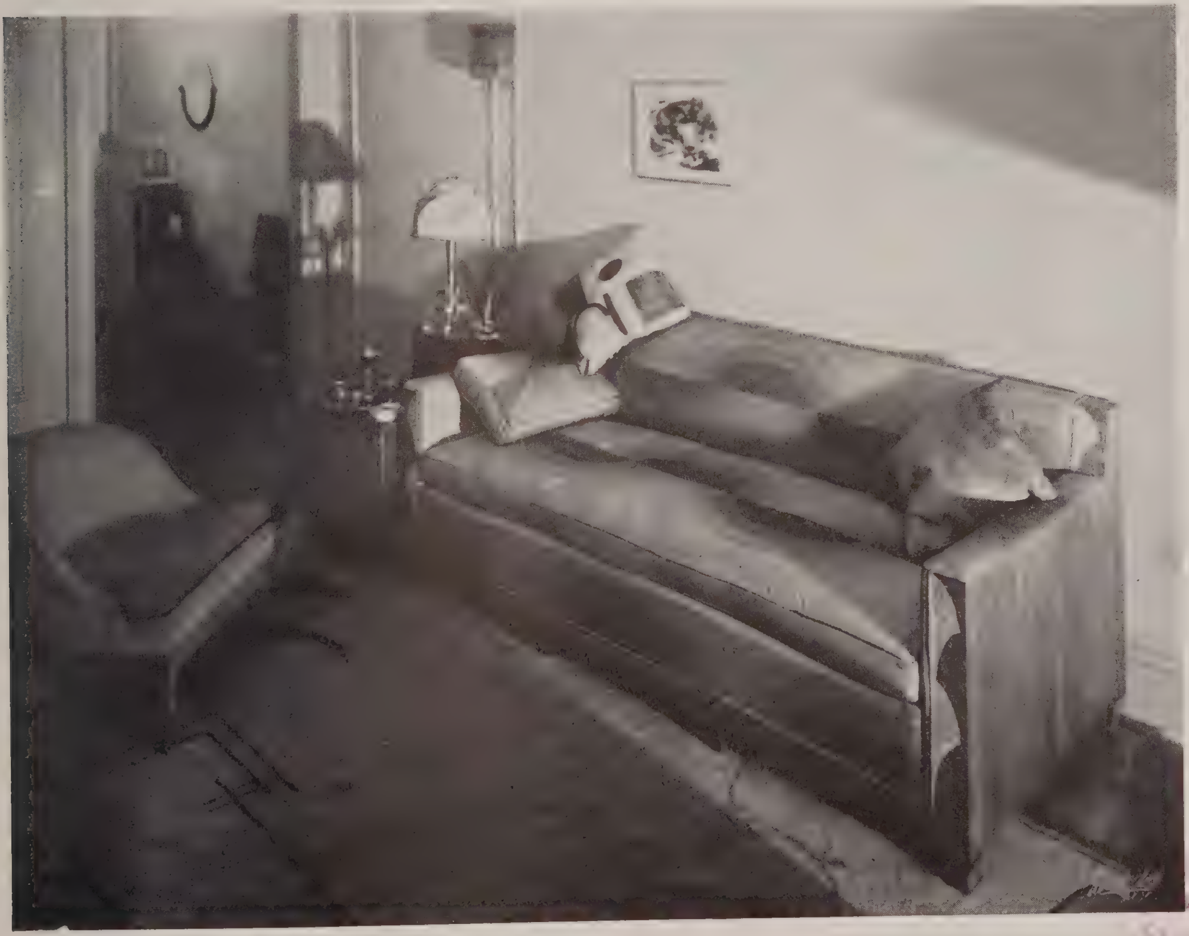
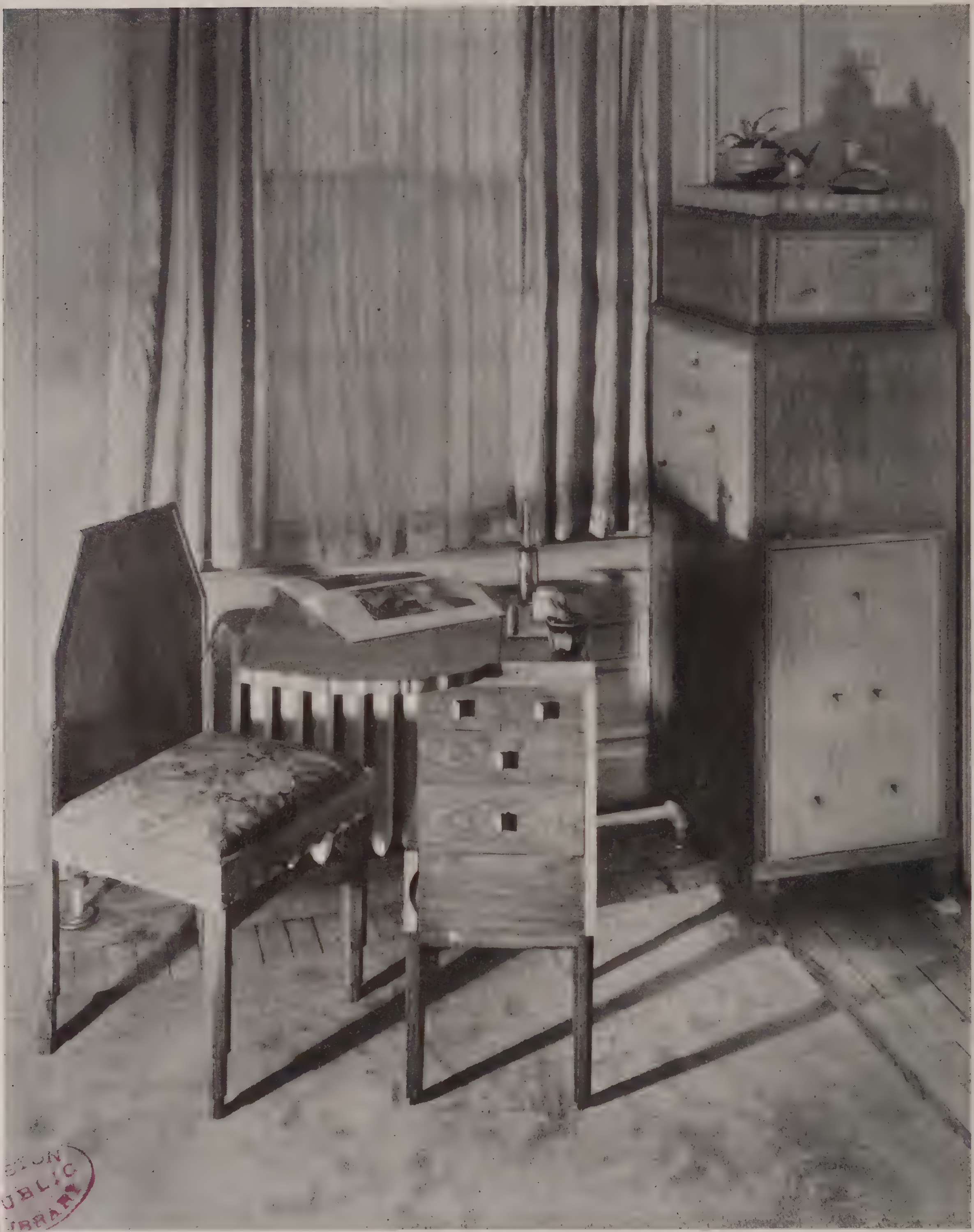


Photo. Apeda

This comfortable couch, designed on simple lines in the modern style, has sides of American walnut and patterned woodwork of old Japanese maple and dark Thuya veneers, and upholstery in a Rodier fabric, "Disc," of silver grays and greens. The side table has satinwood veneered drawer fronts, amaranth case, legs and book holders, silver sycamore trim moulding, and dull steel hardware. The other furniture is elsewhere described



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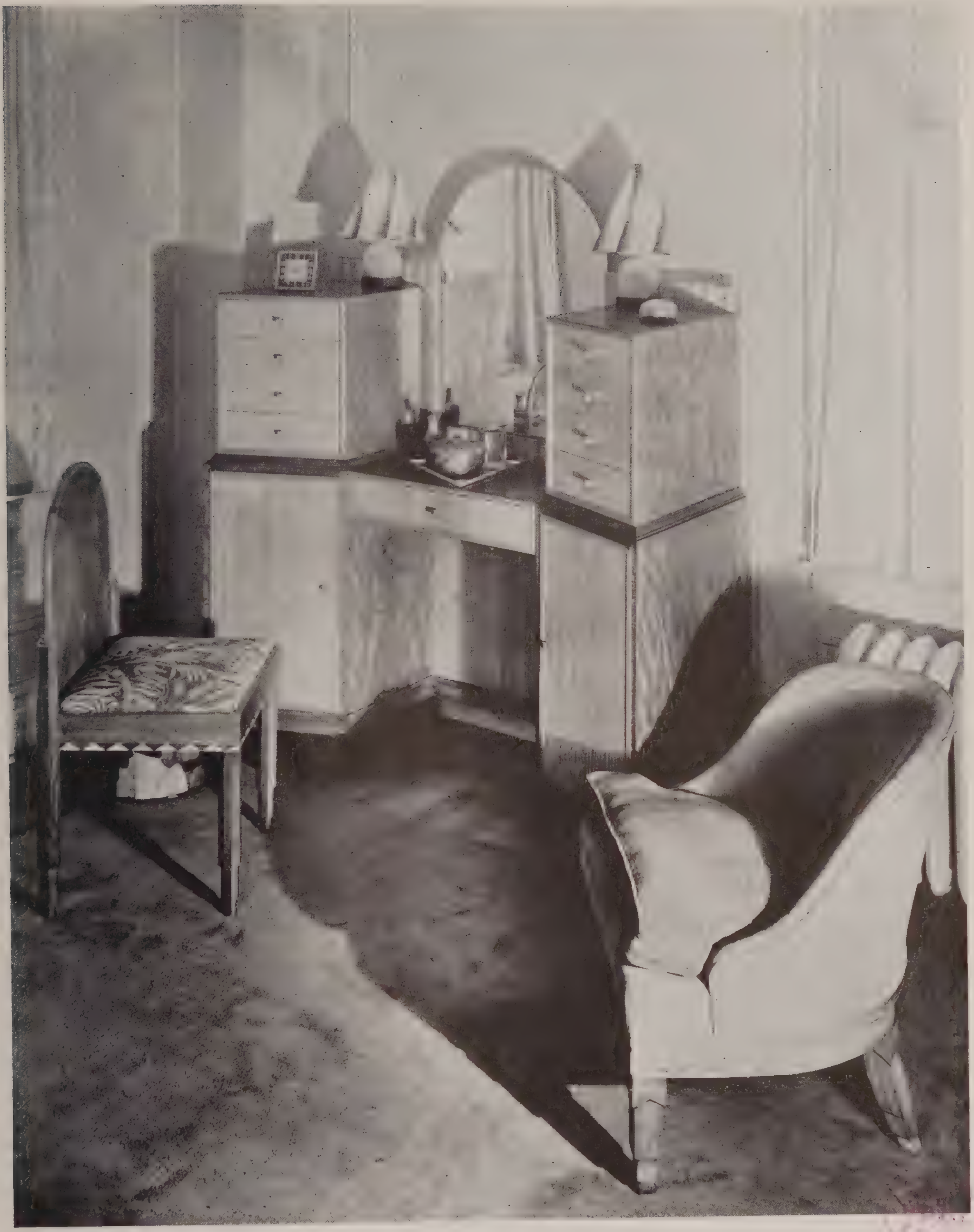
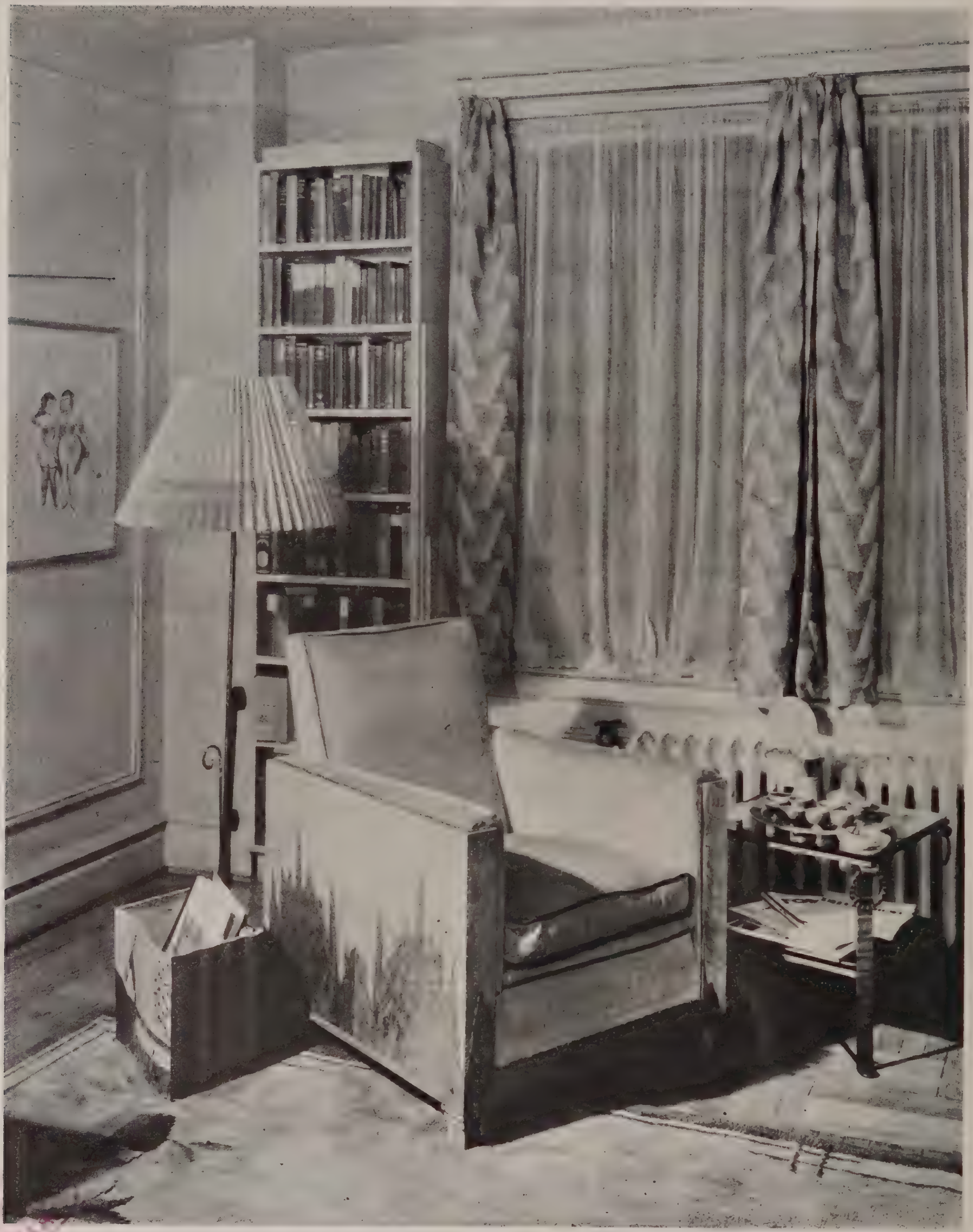
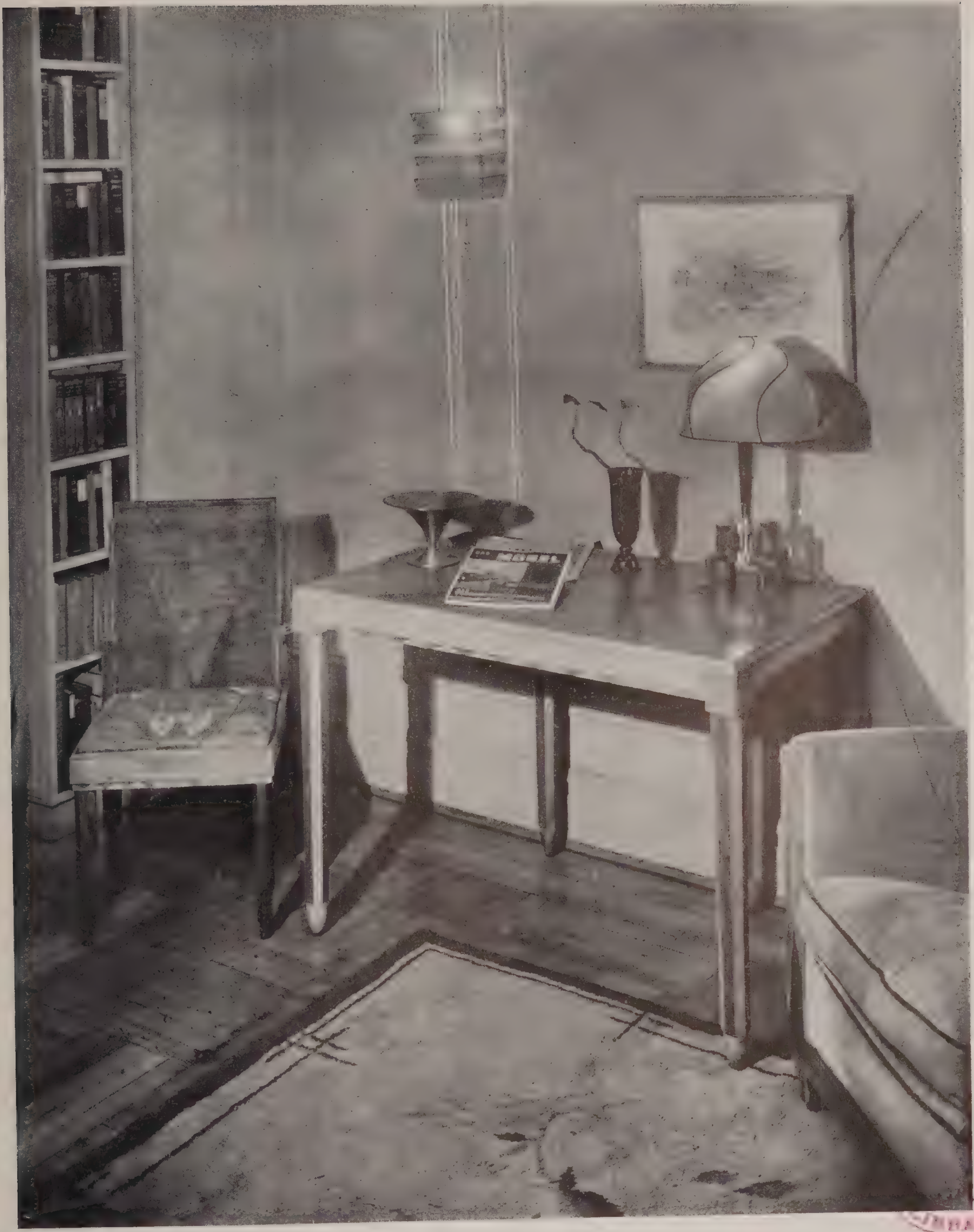
The writing desk chair has a semi-hexagonal back of amaranth veneer. The seat cover is a Mercier damask designed by Dufy. The writing desk has solid American walnut legs and sides, including the drawer fronts, with French walnut back and top and veneered front. The desk is of the tip-table variety with drawers of standard typewriter paper size. This piece was designed to fit the smallest possible space and yet serve its purpose as a writing desk which will safely support a portable typewriter. The standing chest seen at the right of the illustration has drawer fronts veneered with satinwood, the case veneered with amaranth, ornamental fluting and trim mouldings of silver sycamore, and hardware of dull steel. This piece was designed to fit the corner where it stands, but is paneled on the hidden sides so that it may be used in any location



The drawers and door fronts of this dressing table are veneered with satinwood. The case itself is veneered with amaranth, with ornamental fluting and trim mouldings of silver sycamore and bands of dull steel. The triangular tray is of plate glass with mirror pattern and German silver edge moulding. The lamps are of Lalique glass with shades of silk. The small chair has a solid French walnut frame, back and legs, with amaranth strips veneered alternately on the legs and a triangular ornament of amaranth and satinwood around the frame. The seat is upholstered in a Mercier damask designed by Dufy. This chair is one of a set of six which can be used for a dining table suite. The upholstered chair is a stock design by Hammond Kroll; the frame and legs are of natural birch, and upholstery is Rowena fabric; the seat in henna and the rest in scarlet



This box chair is an unusual piece of American walnut veneer with the effect of a forest or group of skyscrapers in profile portrayed by the heart wood with lighter cloud effects in the annual rings of the sap wood. The upholstery is of apricot silk velvet. The waste basket is papered in blue, yellow and green. The iron coffee table with black and clear glass shelves was designed by Jules Buoy. The shade on the lamp is of blue tracing linen with silver brocade borders.



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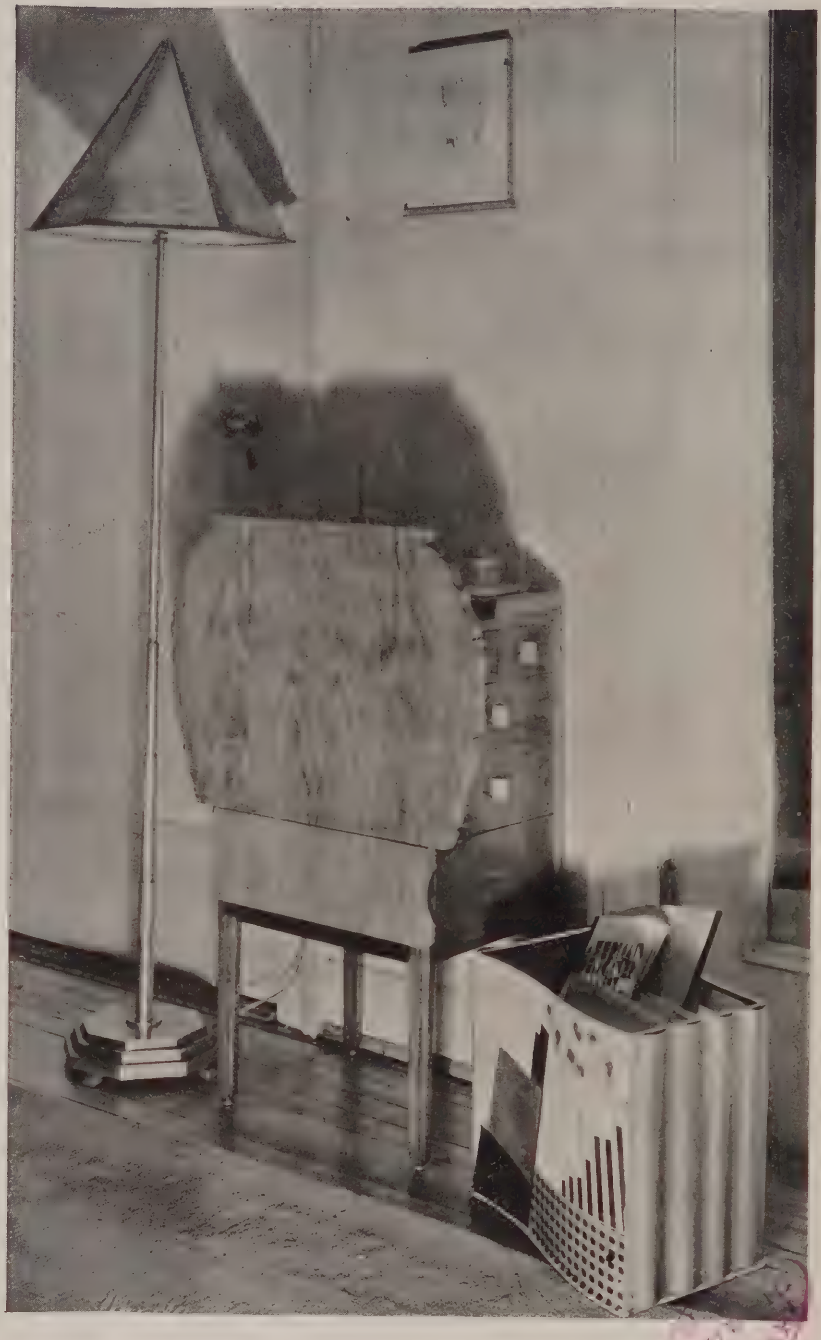
Here is a table of French walnut, the top veneered with amaranth and steps veneered with satinwood. The legs are alternately veneered with amaranth, and the triangular ornament on the apron of the table is of alternate veneers of satinwood and amaranth. This is a convenient living room and dining room table. It has a drop leaf at the back, which may be supported on slides so that it can be used as a dining table for four people. In the dining alcove is a small table for the use of two people, so designed with a drop leaf that it may be joined to this table for the use of as many as eight people. The rear legs have been set back from the side edges so that two or more people can be comfortably seated on the sides when the two tables are joined together. The side chair with arms, which is of amaranth veneer, may be used as a dining room chair when occasion requires. This is the third type of chair shown in these illustrations, chairs which, when grouped together, make a set of six for dining purposes



This small writing desk has already been described on page 92. It is here shown with the drop leaf raised. The steel-finished lamp has a parchment shade in green and yellow

7.a

THE
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ARCHITECTURAL ENGINEERING
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PART TWO

JULY

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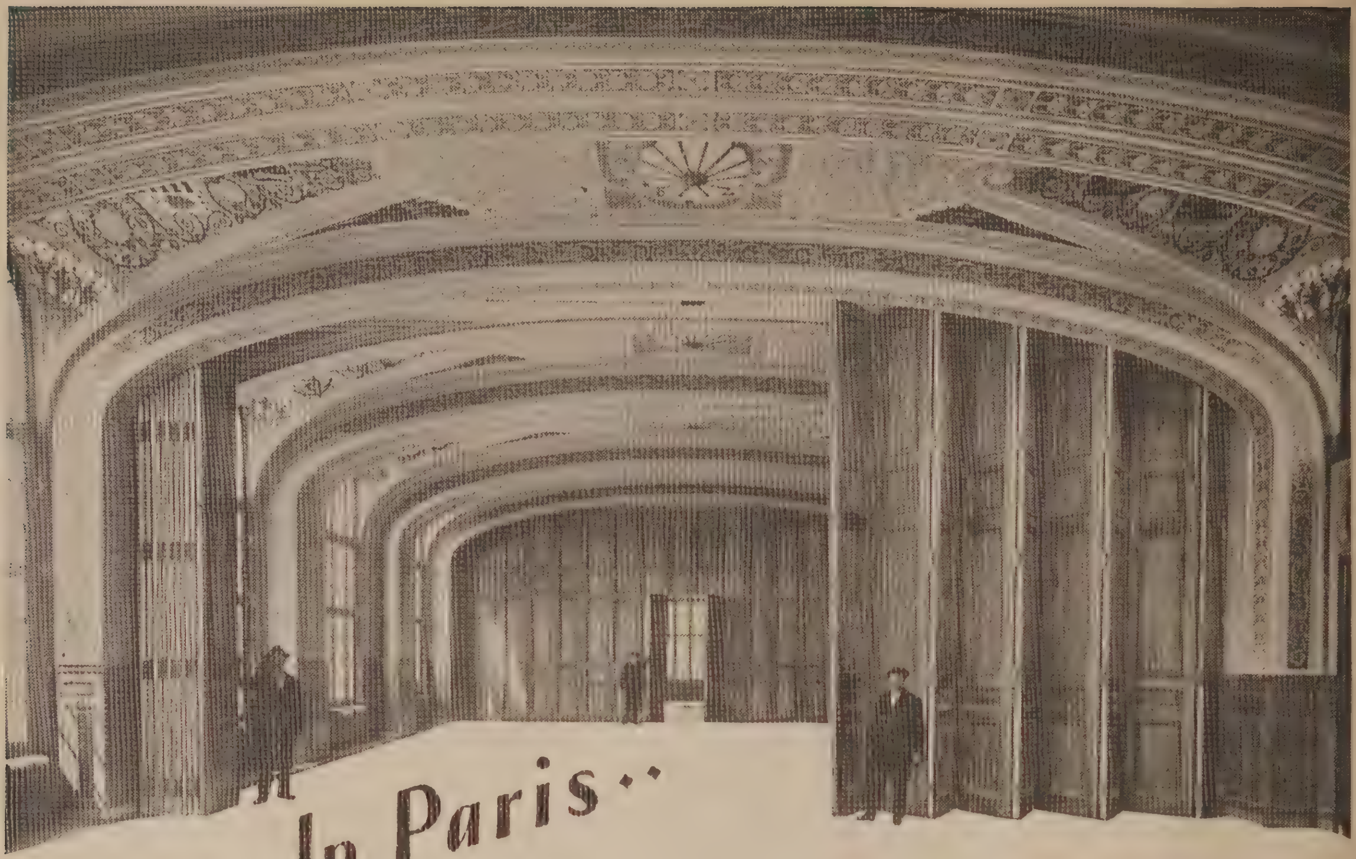

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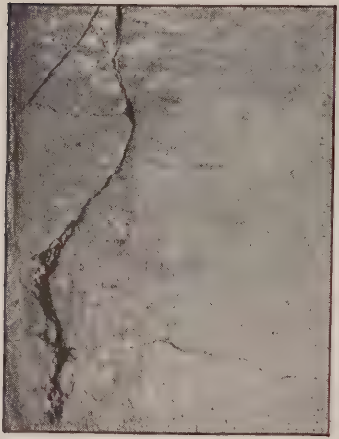

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Red Colormix Floor in the Womans Club, Huntington Park, Calif.

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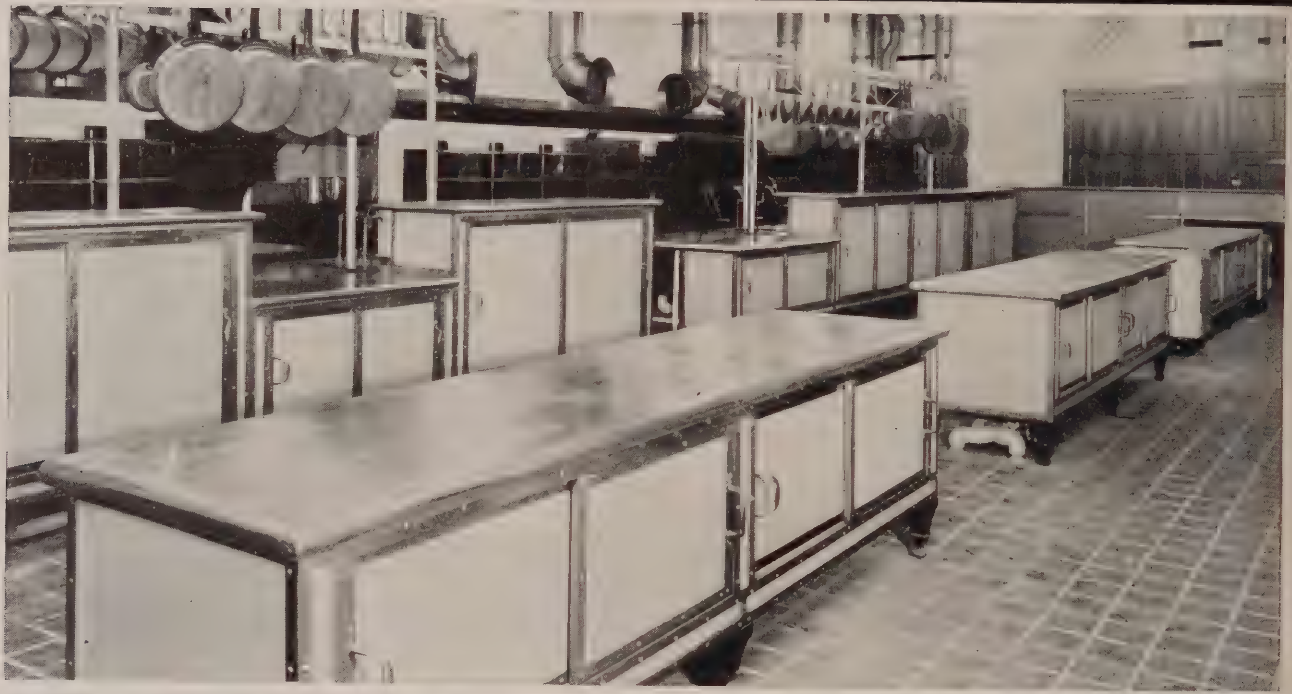

The main service aisle of the New York Athletic Club Kitchen, New York, reflects the character of this brilliant new institution. The entire equipment was designed and built in the great Van Factory.

Above, a view of the Grill, with its panelled counter and special equipment behind.

Right, breakfast and griddle specialties are provided for by this compact department, with the dishwashing section beyond.

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A general view of the vegetable preparation section of the New York Athletic Club. Two Van Steamers are in the right foreground.

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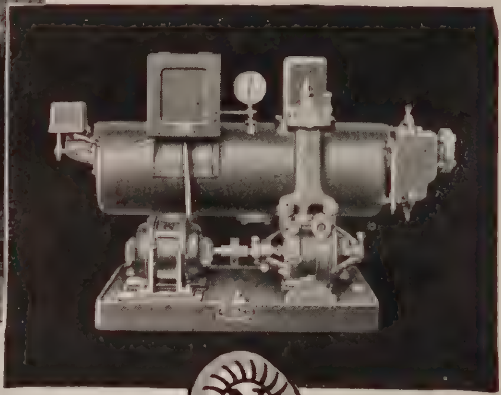

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BOOK DEPARTMENT

THE IDEALS OF ENGINEERING ARCHITECTURE

A REVIEW BY

CLIFFORD WAYNE SPENCER

THE importance of engineering to architecture is something easily appreciated by all, and the necessity for good engineering in buildings has never been so great as in the present era, with its towering structures based entirely on engineering formulæ and principles. This necessity is duly appreciated by the architectural profession, and no architect would dream of attempting to design an important building without the aid of good construction engineers. On the other hand, the importance of architecture to engineering has too often been disregarded, and the country is full of structures whose engineering character has led their designers to feel that any adornment or artistic treatment was unnecessary, so that the resulting structures, by their barrenness or bad arrangement of parts, give a depressing effect of extreme ugliness. The designing of great engineering structures is often entrusted to men trained to figure accurately and to build with great mathematical precision but with little or no understanding of the fundamentals of artistic arrangement and adornment. As the training of architects errs perhaps on the side of too much study of archaic forms and ancient beauty, so the curriculum of the engineering student has contained too little consideration for the æsthetic possibilities of structural forms. More care and consideration for the appearance of engineering works would undoubtedly lead to a greatly improved type of engineering without making it necessary to sacrifice any of the utilitarian or economic advantages so important from a practical point of view. Often the things which go to make or mar the beauty of a structure seem surprisingly trivial. A well designed set of finials may save from ugliness the most ungainly of bridges without the use of any other decorative feature whatever. More often the structure can be given a curving or sweeping motion or rhythm that will add immeasurably to its æsthetic quality without impairing its strength in the least. Therefore, the attention of the architect is needed.

Part of Dam at Croton, N. Y.
From "The Ideals of Engineering Architecture"

New discoveries in engineering science have added greatly to the resources at the command of the engineering designer and doubtless will continue to do so. New materials and new ways of using old materials also are opening up vast new possibilities in the field of engineering as well as in that of architectural design. The comparatively modern use of steel and concrete, both independently and in combination as ferro-concrete, has put into the hands of the designer a medium of vast possibilities which at the same time provides unprecedented structural advantages. In the use of these materials engineering plays a far more important part than ever before, the materials and new scientific processes making possible a much lighter type of construction than was ever possible in the old masonry and wooden structures, and at the same time permitting buildings to be carried to almost unlimited heights. These new possibilities make it more desirable than ever that more attention be paid to the artistic planning of engineering works. If an engineer is to plan the whole, he should be sufficiently grounded in the basic principles of art and architecture to enable him to work out his designs in the most pleasing manner possible. On the other hand, if a special consultant is to be employed to beautify the structure, he should strive to understand the underlying principles and purposes of the work, for in no other way will he be able to achieve that harmonious and satisfying effect which should result.

For nearly two decades Charles Evan Fowler has been working to "develop a trend of thought, along somewhat systematic lines, tending toward a real system for the treatment of engineering structures by means of basic architectural design." His book on this subject has recently been published and is entitled "The Ideals of Engineering Architecture." Mr. Fowler is an eminent consulting civil engineer, the designer of many important structures, and author of many works on engineering and architectural subjects. The volume itself is perhaps the most extensive work on the subject of engineering architecture yet produced and covers the subject in a

Unless otherwise noted, books reviewed or advertised in THE FORUM will be supplied at published prices. A remittance must accompany each order. Books so ordered are not returnable.

most complete and thoroughgoing manner. Most of the text matter is in the form of descriptions and criticism of a large number and variety of engineering structures in all parts of the world, with special reference to the design features of the examples shown. These discussions are abundantly illustrated from photographs of the structures themselves, showing features favorable or unfavorable to the appearance as pointed out by the author in the text descriptions. The ideas and aims of the art of engineering architecture and the part played by the structural engineer in the new architecture are discussed at some length in the introduction, and there is also a brief historical sketch of engineering architecture including a description of the seven wonders of the ancient world. A very clear statement of the fundamental considerations governing a good engineering and a good architectural design is given, and a comparison drawn between them, the prerequisites of good architectural design being sincerity, propriety, style, and scale. As a matter of fact, the fundamentals are probably much the same in both cases, and the symmetry, harmony, simplicity and proportion ascribed by the author to good engineering design are but other words to define the sincerity, propriety, style and scale said to be necessary to successful architectural design. The major portion of the work is devoted to bridge design, this being the class of structure which is most likely to be entrusted to the engineering profession. Stone bridges are among the oldest in the world, and their design is the result of tradition developed through the ages, the most usual form being that of the arch. Many fine examples are shown, and the lessons drawn from the criticisms by the author will be found valuable in other lines. Concrete bridges are a more modern development and lend themselves readily to architectural treatment, as is very evident from the examples discussed in the chapter on "Concrete Bridge Design." Steel bridges are by far the most important, commercially, in this country and have furnished some of the worst as well as the best examples of bridge architecture. Many types and varieties are described and illustrated, including among others, the Forth Bridge, Scotland; the Queensboro, Hell Gate, and Brooklyn Bridges, in New York, and many other existing and proposed spans. The treatment of details, abutments and piers and the application of ornament to all sorts of engineering work are discussed, and the chapters on "Stone Towers," including lighthouses, steel towers, mooring masts for dirigibles, dams and power houses are all interesting from the architectural point of view and important from that of engineering.

In the modern era it has more than ever before come to be necessary for the architect to understand the engineering point of view, and since the great variety of subjects which form the basis of architectural education will not permit the student to go into the more technical phases of engineering to any great extent, it is very fortunate that we have available a work written by one who sees problems as the engineer sees them and is yet keenly alive to the artistic possibilities latent in every structure. The work abounds in matter of value to both architects and engineers and deserves wide circulation.

THE IDEALS OF ENGINEERING ARCHITECTURE. By Charles Evan Fowler. 303 pp., 6 x 9 ins. Illustrated. Price $4. Gillette Publishing Company, 221 East 20th Street, Chicago.

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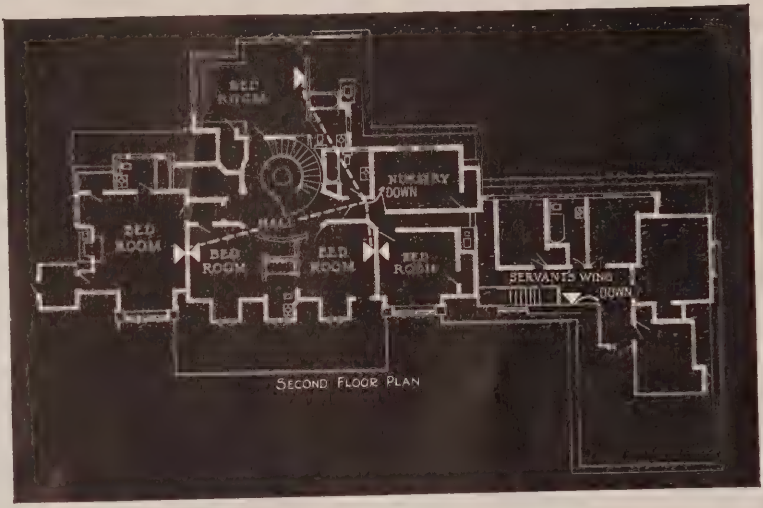
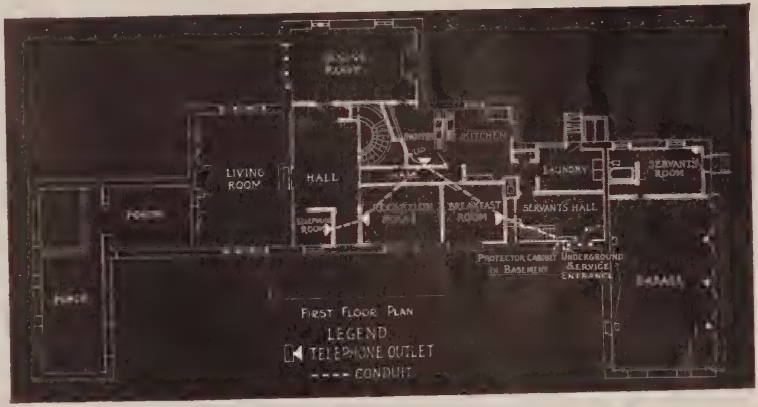
Telephone Convenience is an Important Feature in the Planning of Modern Residences





The new residence of Mr. Thomas B. Wanamaker, in the suburbs of Philadelphia, showing the telephone outlets and conduit layout which provide for modern telephone convenience.—McIlvain & Roberts, Architects.

Increasing attention is being given by architects, in the design of modern residences, to the location of telephones. It is becoming generally recognized that the time to plan for telephone arrangements is when a house is being built or remodeled. In co-operation with telephone company representatives, architects are including provision for telephones in the plans of the house by specifying that conduit be laid within the walls. The necessity of exposed wiring is thus easily avoided.

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THE NEW MODE OF INTERIOR DECORATION

A REVIEW BY

CLIFFORD WAYNE SPENCER

WHEN a movement attracts as many followers and creates as widespread a disturbance among people of culture and understanding as does the so-called "modern art" movement, we should endeavor to decide for ourselves, if possible, just what its possibilities are and whether it is to become a lasting part of the world's art or is merely a frenzied attempt on the part of a dissatisfied and restless group of artists to accomplish overnight that which would normally require a period of one or more centuries to work itself out. Certain it is that a vast number of artistic sins are being committed in the name of modern art and that many people without the requisite good taste and background to create objects of beauty have seized the opportunity to foist on an unsuspecting public all sorts of atrocities bearing the *art nouveau* label. On the other hand, there can be no doubt that an underlying current of truth and reason runs through the movement, and that as time goes on a definite and national style will be evolved. As is always the case with a new movement of this sort, there is a tendency to unduly ridicule the efforts of its followers, due largely to lack of understanding of the ideals and aims actuating them. We are very likely to ridicule and make fun of that which we do not understand, and lest we condemn unjustly, it is always well to make an effort to comprehend the viewpoint of those who believe in the new movement before forming fixed and definite opinions.

Much of the published material on this subject has been of such a nature as to still further confuse the earnest seeker after understanding, it apparently being the habit of writers on this topic to envelope the entire subject in a veil of abstractness and absurdity. The simplicity and logic back of the movement is admirably expressed in the book entitled "The New Interior Decoration," by Dorothy Todd and Raymond Mortimer. According to these authors, the new design is a natural product of the age we live in,—the age of science and standardization. The theory is that the beauty that expressed the life of bygone eras should not be borrowed and grafted onto our own lives, but that we should evolve a new set of ideals of beauty inspired by the objects that surround us. The industrial prosperity of the present century is due not only to the invention and development of machinery but also in a large measure to the methods of modern business management. Scientific studies of production methods have been made and have rendered it possible to eliminate from the processes of manufacture much of the lost motion and other elements not absolutely essential to the making of the finished product. It is this elimination of the unnecessary that the modernists claim to be their keynote, and they propose to carry the efficient methods of modern business into the private lives of the people and to express in their surroundings the spirit of the new industrial civilization.

They propose to treat the modern house as a "machine for living in," and claim that "gracefulness in things, as in persons, results from an elimination of the unnecessary,—so that in order for a thing to be beautiful it must be useful." The modern designer "begins with an idea of utility and achieves beauty by careful arrangement and proportion of the necessary parts." Since the furnishing and decoration of a house depend largely on the manner in which the house is built, the authors of this work on interior decoration devote a great deal of space to a discussion of architecture and of modern architecture, which they claim to be a new renaissance of architecture based on the beauty of utility and made possible largely through the use of the new materials,—steel and ferro-concrete,—it being no longer necessary to work within the narrow confines prescribed by the use of brick, stone, and timber. The new materials and new engineering science permit of previously impossible shapes and sizes, and this gives the modern designer unlimited new opportunities. As the authors of the present work point out, "forms in architecture depend principally upon the materials employed, and the contemporary renaissance in architecture comes from the discovery of a new material,—reinforced concrete. With the use of a steel framework, the break with the old forms became a logical consequence. The first possibility afforded by these materials is that windows can stretch from wall to wall of a room, from one concrete support to the next. A house, if desired, may be entirely walled with glass. Hitherto the width of windows has been limited by the material,—stone or brick or wood,—which spanned their tops. It has been usual to light a room with tall, narrow windows. Today it is possible to use the more logical method of having a window at the level of the eye running the entire width of a room. In this way the general appearance of the facade at once changes. Horizontal lines dominate, and the ground floor plan dictates the form of the exterior."

Modern life is characterized by a tendency to concentrate a large number of people in limited areas, so that it has become, "more economical, as well as more harmonious, to build houses in series instead of singly. By standardizing various types of houses it is possible to enormously reduce the cost. The individual house is already an anachronism in cities, for the nineteenth century practice of making a street a collection of narrow houses, like towers, is utterly unpractical. But it is possible to build enormous buildings, each apartment in which, has its open air terrace and garden. To facilitate this and to give light and air to streets, the buildings in the centers of cities are bound to approximate in form increasingly the pyramid. Already the zoning laws in New York are resulting in buildings of this sort, but in cities, where the space is less limited, the angle of retreat from the street can be advantageously more acute. In the past enormous mansions were built for the rich, confined cottages for the poor. Slowly these inequalities are disappearing. The modern house or flat needs to be large enough for a small family, and no larger, for the diminution in the supply of domestic servants is certain to continue. The modern architect is solving the problem by building the house as one large room with alcoves and balconies intended to serve various purposes."

In treating interior decoration, the subject is divided

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DIXON'S INDUSTRIAL PAINTS

Known for more than 65 years as Dixon's Silica-Graphite Paints into two parts,—one on continental decoration and the other dealing with English and American decoration. The history and development of decoration have been closely bound up with that of architecture, and as in architecture the first requisite of good furniture is utility and comfort; especially is this true as regards chairs and beds. "With regard to the actual decoration of a room, there is naturally great variety of opinion. Le Corbusier advocates extreme simplicity,—color-washed walls; tiled or composition floors; unshaded opaque electric light bulbs hanging from metal pipes or ordinary twisted electric wires; no curtains; bent wood chairs; metal desks; and the pictures,—if any,—carefully placed to focus the architectural forms of the room. The habit of concealing radiators in framework of Louis Quinze design is naturally abhorrent to these decorators, who not only reject all 'period' decoration as unsuitable to the present, but delight in emphasizing the beauty of function. There is usually no attempt to mask gas or water pipes that run along the wall." Whenever possible, furniture is made in the form of built-in fixtures and becomes definite parts of the architecture of the room. "Economy in labor as well as the increasing demands of hygiene, receives in the modern house an attention it never received before. For floors a composite material of cement, sawdust and cork is now much used in France. It is durable and easily cleaned without being noisy, and can be procured in various degrees of hardness. Today our hygienic dislike for dust has led to a positively æsthetic preference for such objects as least collect it. A room crammed with dust traps offends our eye, and as a result there is a tendency to use American cloth where our parents would have used velvet. Chairs and tables can be painted with the same hard enamel which is used for motor car bodies, which neither marks with wet nor can be easily scratched."

Opposed to this school of decoration there is the more conservative work of the English decorators, whose problem more often consists of transforming an old interior and making it suitable to the uses of an up-to-date civilization. In this they have been particularly successful in creating a more intimate type of treatment. The authors of the present work admit that while from their point of view there is practically no worth while contemporary English architecture, "it is arguable that their interiors are better suited to contemporary sensibility than the austerer work of the French school. The mechanical forms, the absence of all caprice, it may be said, will possibly suit the civilization of the future. They seem intended for Robots, rather than for human beings. As life grows more uniform and is increasingly dominated by machines, we may wish in our homes to escape from this impersonality. We need fantasy, imagination, within our houses. We want to relax, to enjoy intimacy, to feel,—as well as actually to be,—comfortable. The Le Corbusier style of decoration is as formal as the old French *salon*, which had hard backed chairs at regular intervals all around it. We require our homes to be more quiet, more informal, more personal. It is difficult to say that one of these attitudes is right, and the other wrong." As to American architecture and decoration, the authors are somewhat non-committal, merely expressing a vague hope that "the approaching years are likely to witness a vigorous revival of original design."

About half of the book consists of a plate section showing illustrations of examples of work in all phases of the modern design. The work of Le Corbusier receives considerable attention and is represented in illustrations of many rigidly severe interiors, including an entrance hall in which the heater with its accompanying smoke pipe and water pipes constitutes the predominating decorative feature. Many of the interiors which follow are perhaps more intimate and somewhat more cheerful, and yet in all the impression is one of that clean barrenness which one usually associates with the interiors of refrigerators or hospitals. The illustrations of furniture include many extreme types, such as chairs consisting of pieces of bent pipe over which are stretched pieces of cloth or other material. These certainly constitute a good illustration of the "principle of the elimination of the unnecessary," and although they may have been designed to give a maximum of comfort they certainly do not give comfort to the eye. Mural decorations by Duncan Grant and Vanessa Bell are allotted considerable space and illustrate some of the best work of the modern English designers. The fabrics, rugs and tapestries shown are very interesting and in many cases attractive, since this sort of material lends itself more readily than some others to the forms of modern art, and the new fabric designs are often pleasing even to those who do not care for modern art in its other forms.

The final chapter is devoted to a description of the practical methods used in obtaining the modern effects, and for those who wish to try their hand at the new decoration, it should furnish many pointers and much valuable information on rearranging older rooms in the newer manner. Advice is given as to the selection and arrangement of furniture and fittings, methods of lighting, floor coverings and carpets, and curtains and textiles.

For those who wish to know what the new movement is all about, this is perhaps as sanely written an explanation as has yet come to our attention, and the illustrations indicate the tendencies of some of the better class of interior decoration in the modern manner. "The authors do not consider that all the experiments illustrated are successful; but they have tried to choose illustrations representative of the best work known to them. They believe that the twentieth century is likely to be distinguished by an important renaissance in architecture and the arts subsidiary to it, and it is their hope that this book, incomplete as it is, may help to persuade others of this exciting possibility. They have deliberately excluded from their survey all work in which traditional styles, even in modified forms, are apparent." They also claim to have excluded all work claiming to be modern but which is "only eccentric." The uninitiated, on viewing the frontispiece might be led to wonder just where the distinction lies! As has already been said, this new type of decoration and furnishing should be studied and its philosophy examined before an opinion is formed. Nothing worthless could have aroused such enthusiasm and enlisted so many earnest followers, and even the most conservative sometimes admit (though perhaps reluctantly) that in some of its more moderate aspects the style has a certain charm as well as interest.

THE NEW INTERIOR DECORATION. By Dorothy Todd and Raymond Mortimer. 92 Plates, 42 pp., text 8½ x 11 ins. Price $6. Charles Scribner's Sons, 597 Fifth Avenue, New York.

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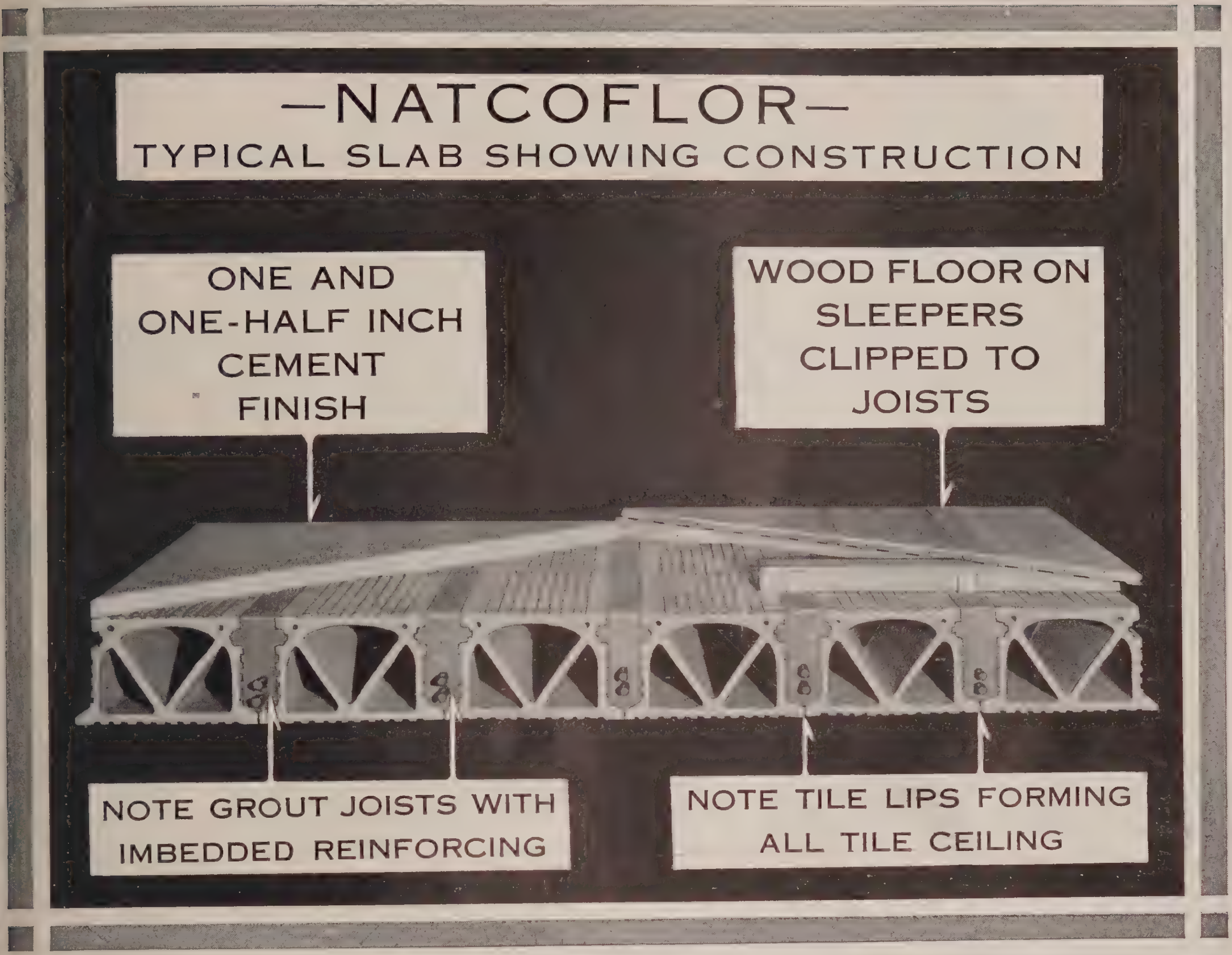
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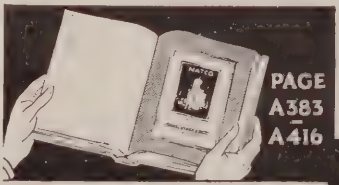

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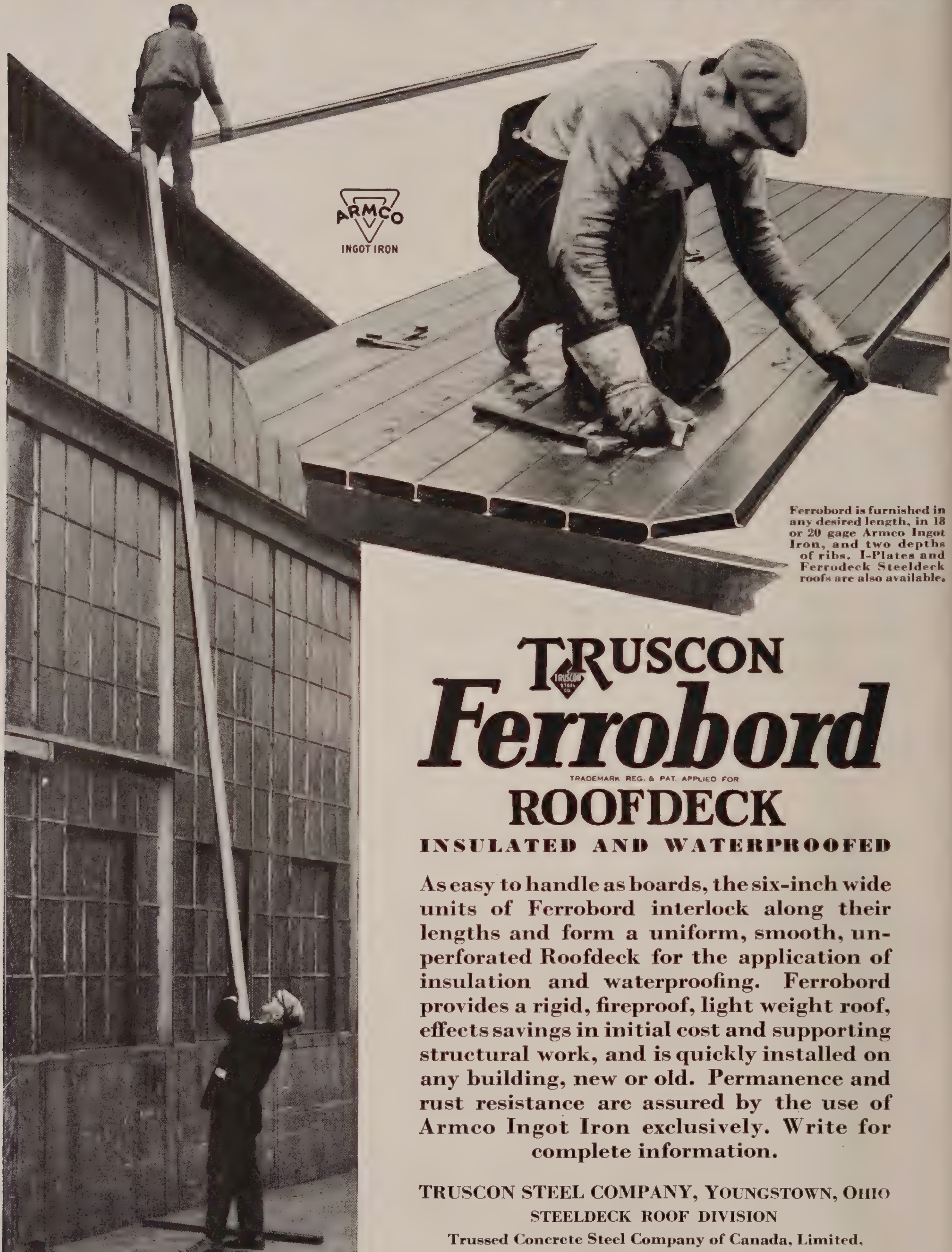

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THE
ARCHITECTURAL
FORUM

VOLUME LI NUMBER ONE

JULY 1929

MINIMIZING HEAT LOSSES IN RESIDENCES

BY

P. E. FANSLER

NOT so long ago the heating plant was just a heating plant; the architect was chiefly concerned with the æsthetic side of his profession, and with the attempt to reconcile his clients' usually hazy and frequently absurd demands with the possibilities in structure and design. Having accomplished this essential task, the architect generally passed on, *in toto,* the problem of heating to the local artisan, of plumbing to the specialist in that line, and the lighting to the electrician.

Today, due largely to the intensive research that marks the age, heating plants for homes, as well as for commercial and industrial buildings, have reached a stage of specialized development, and the architect who would intelligently advise his clients is forced to inform himself regarding the highly perfected equipment now available.

With growing consciousness of the need for and possibilities of economical heating plants has come an appreciation of the fact that there is little use in specifying and having installed a highly efficient heating plant unless an equally intelligent effort is made to conserve the heat that is generated. Consequently, we find a rapidly growing industry, nurtured largely by the heating industry, concerned with the conservation of heat.

An important factor in the rapid development in this field is the research that has been carried on during the last four or five years, first at the research laboratory of the American Society of Heating and Ventilating Engineers, and later, under the guidance and correlating influence of the society, extended to the research laboratories of nine great technical schools. Far from being an academic and impractical sort of research, this has been so thoroughly practical that the data developed have had almost immediate application to the problem of more efficient construction.

Where Heat Goes. This article is but a brief summary of the problem of preventing heat developed by the heating plant from "heating all outdoors." Obviously, all of the heat generated in the boiler or furnace during the entire heating season does "escape" from the house; otherwise the house would grow hotter and hotter until spontaneous combustion would be initiated. But if the *rate of loss* can be reduced to the irreducible minimum, the fuel requirements of the owner also will be at a minimum. The problem, then, is to *minimize the rate of heat loss.*

Analysis of the problem shows that fuel is consumed to replace heat lost (a) through the walls, (b) through the window glass, (c) through ceilings and roofs, (d) through doors that are, from time to time opened, and (e) through infiltration, i.e., in heating to room temperature the cold air that filters in through cracks around windows and doors and, in poorly constructed houses, through the walls themselves.

A study of a large number of typical houses shows that these losses average about in this way:

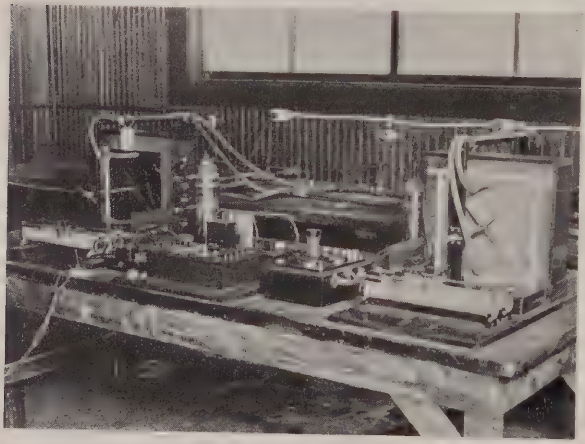
(a) Heat loss through walls, 27%
(b) Heat loss through glass, 26%
(c) Heat loss through roofs, 16%
(d) Heat loss through opened doors, 4%
(e) Heating infiltrating air, 27%

It is to be seen that three of these items constitute 80% of the total loss of heat; it remains to be seen how much these items can be reduced.

Reducing Wall Losses. Briefly, heat loss through walls depends upon the wall area and the coefficient of heat transmission. This coefficient is the number of British thermal units transmitted per hour, per square foot of area, per degree Fahr. difference between the inside and outside air temperature for such air conditions as exist in the coldest weather in the locality under consideration. Designated as "U," this coefficient then becomes a direct measure of the ability of any wall structure to retard heat flow.

Coefficients for typical building construction of today are given in Fig. 1 and these typical types of present-day practice. As the largest and smallest values of U are approximately in the ratio of 2:1, it is evident that the best wall construction will allow heat to escape at about one half the rate of heat loss through a wooden wall of cheap and common construction. If, then, a house has a gross wall area of 2,400 square feet, with 20% windows, the net wall area will be 1,920 square feet, and the heat loss through this wall will be slightly less than 30% of the total heat loss for the house. If the house were built of frame construction of the better sort, wood lath and plaster on one side of the studding and sheathing, building paper and lap siding on the other, the transmission coefficient would be 0.222. If, however the lap siding were replaced by stucco on metal lath, and if the spaces between the studding were completely filled with a poured insulation, the coefficient would be reduced to 0.110—almost exactly one half that of the uninsulated construction. With this latter wall then, it would be possible to save about half of the 28% heat loss charged to the net wall area, or 14% of the heat that would be lost through the cheaper construction. Other materials properly applied could produce a wall equally as heat-resistant.

Heat Loss Through Glass. Taking the heat loss through the glass of our typical house as 26% of the total loss from the house, we are immediately faced with a difficult problem in trying to reduce this loss. The quality of glass and the thickness have practically nothing to do with it. A double glass window, if the two panes are close together, approximately one quarter inch apart, transmits less than one half the heat passed through a single thickness of glass, but practical difficulties, such as keeping moisture and dirt from the inner surfaces, put a damper on such usage. If use of three panes were practical, this 26% loss could be reduced about three quarters.



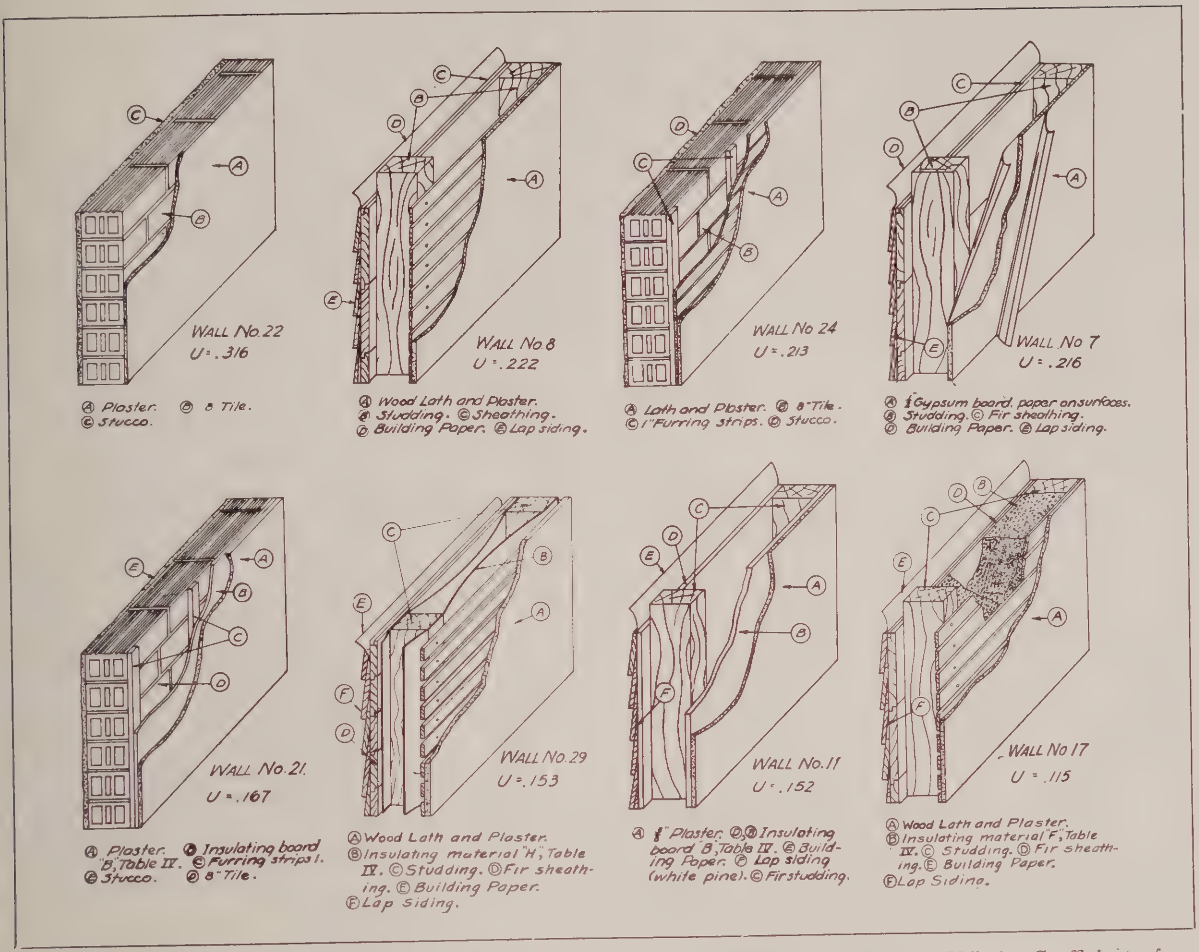
Apparatus for Testing Heat Conductivity of Building Material by Hot Plate Method

Roof Losses. Losses through roofs vary even more than through walls. For a roof with wood shingles on wood strips and with nothing on the under side of the rafters, the coefficient may be taken as 0.50, while with the same construction with the addition of 2-inch sheets of corkboard nailed to the under side of the rafters and plastered on the inside, the coefficient would be almost exactly one fifth as great. An equally heat-resistant construction would be shingles over wood strips, wood lath and plaster on the under side of the rafters, and the spaces between the rafters evenly filled with an insulating material. There are, of course, many insulating materials and many more combinations of structural and heat-resistant materials. Thus it will be seen that it is possible to save, as between the poorest and best roof construction, about four fifths of the 16% of the heat loss of our average house.

The loss attributed to opened doors is quickly disposed of; it is small, and it is hardly controllable by the architect.

Infiltration. Cold air entering through the walls, and through cracks in and around windows and doors, as the result of wind pressure on the house, requires an expenditure of fuel as great as that required to offset the heat loss through the material walls,—almost 30% of the total. This loss can be materially reduced (a) by the use of high class weather strips, properly installed; (b) by applying so-called storm windows, properly calked, on the windows taking the brunt of winter winds; (c) by installing, when the house is built, windows and doors having a minimum of cracks, both in length and width; (d) by reducing the number of windows on those sides of the house exposed to normal winter storms; (e) by calking the cracks between window and door frames and walls, and (f) by giving careful attention to the construction of the walls themselves. Here we find many factors contributing to the loss, and as many possible ways of minimizing the wastage of fuel.

In many classes of construction metal windows are being used more and more, and manufacturers of this kind of equipment are leaving no stone unturned to produce windows that will be as nearly air-tight as possible. As an example of the leakage of residential casement steel windows, a test at the University of Michigan showed, with an indicated wind velocity of 20 miles an hour, and with the window as tight as good manufacturing and installing could insure, a leakage of only 25 cubic feet per hour per linear foot of movable portion of window. To illustrate the effect of a slight opening,—with 1/64-inch shims placed between the weathering contacts at the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WALL No 7
U=.216
Ⓐ ½" Gypsum board, paper on surfaces.
Ⓑ Studding. Ⓒ Fir sheathing.
Ⓓ Building Paper. Ⓔ Lap siding.
WALL No.21.
U=.167
Ⓐ Plaster. Ⓑ Insulating board "B," Table IV. Ⓒ Furring strips 1.
Ⓔ Stucco. Ⓓ 8" Tile.
WALL No.29
U=.153
Ⓐ Wood Lath and Plaster.
Ⓑ Insulating material "H," Table IV. Ⓒ Studding. Ⓓ Fir sheathing. Ⓔ Building Paper.
Ⓕ Lap siding.
WALL No.11
U=.152
Ⓐ ⅞" Plaster. Ⓓ,Ⓑ Insulating board "B," Table IV. Ⓔ Building Paper. Ⓕ Lap siding (white pine). Ⓒ Fir studding.
WALL No 17
U=.115
Ⓐ Wood Lath and Plaster.
Ⓑ Insulating material "F," Table IV. Ⓒ Studding. Ⓓ Fir sheathing. Ⓔ Building Paper.
Ⓕ Lap Siding.

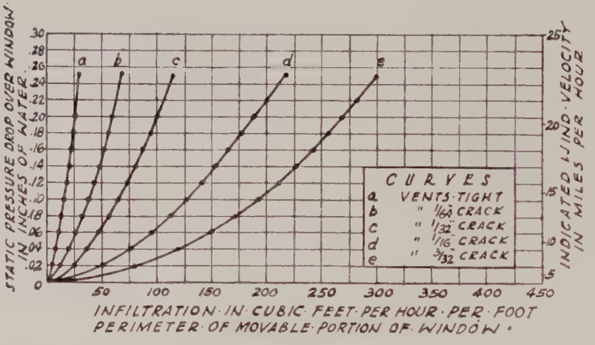
Fig. 1. Common Types of Wall Construction. The Smaller the Numerical Value of "U," the Coefficient of Heat Conductivity, the Better the Wall as an Insulator

swinging edge, the leakage was 100 cubic feet,—four times as great,—while with the crack increased to 3/32 inch, the air streamed through at the rate of 260 cubic feet per hour. It will be evident that the architect who makes a careful study of infiltration prevention can render a real service to his client who builds a house but once and buys fuel every heating season.

Quantitative Tests. The earliest studies to quantitatively determine heat loss from building structures were made on walls and roofs. These showed how widely the rate of heat loss varied with the individual materials and with the methods of using and combining them. The derived data stimulated the American mind to discover preventatives of heat loss,—and the era of house insulation began. One of the most important aids to the advancement of knowledge of heat loss through walls and roofs is the heat-flow meter, developed from a crude laboratory device to a practical field instrument by Percy Nicholls, physicist at the U. S. Bureau of Mines experiment station, Pittsburgh. This device is applied directly to the wall or roof under investigation and permits the instantaneous and direct measurement of the *rate of heat flow.* Naturally it indicates flow inward as well as outward, and one of the most fascinating evidences of its sensitiveness occurs when it is attached to the under side of a roof. On a bright day, when the rate of flow is approximately constant, the passage of a heavy cloud over the face of the sun is almost instantly shown by the meter reading.

It has been determined, through the use of this meter, that the flow of heat through a new wall is not what it will be under identical temperature conditions when the wall has aged. Also, when the wall is wet after a rain, the resistance to heat flow is not what it is when the wall is dry. Furthermore, the wide variations found in concrete walls, due to differences in "mix" and method of construction, have corresponding variations in heat flow.

Data on heat flow through homogeneous materials were both abundant and accurate, thanks to precise laboratory tests, but when it came to determining heat flow through typical composite walls of modern structures, the heating engineer



Curves Showing Infiltration Through Metal Casement Sash Under Various Conditions

was hard put to it. The conductance of a composite wall (the B. t. u. transmitted per square foot per hour per degree Fahr. difference between surface temperatures) had, in the past, been computed by an empirical formula, depending upon values experimentally determined; the accuracy of the final result also was open to question.

The worth of the heat flow meter in checking values of conductance of composite walls for which the computed values were known, as well as for finding values for walls difficult to handle by formula, at once became apparent. An elaborate series of field tests made during the last year, offers illuminating information on this subject.

The three last items indicate the interesting findings in regard to concrete, brick and tile, the fact that computed figures previously accepted probably are not accurate, and that a wide divergence exists in conductance where concrete is one of the elements, due to the wide difference in physical characteristics and the lack of uniformity in a given wall. Because of this discovery, a great deal of attention is being given to this phase of the study, and it is expected that both the range in actual values and safe average figures will be determined.

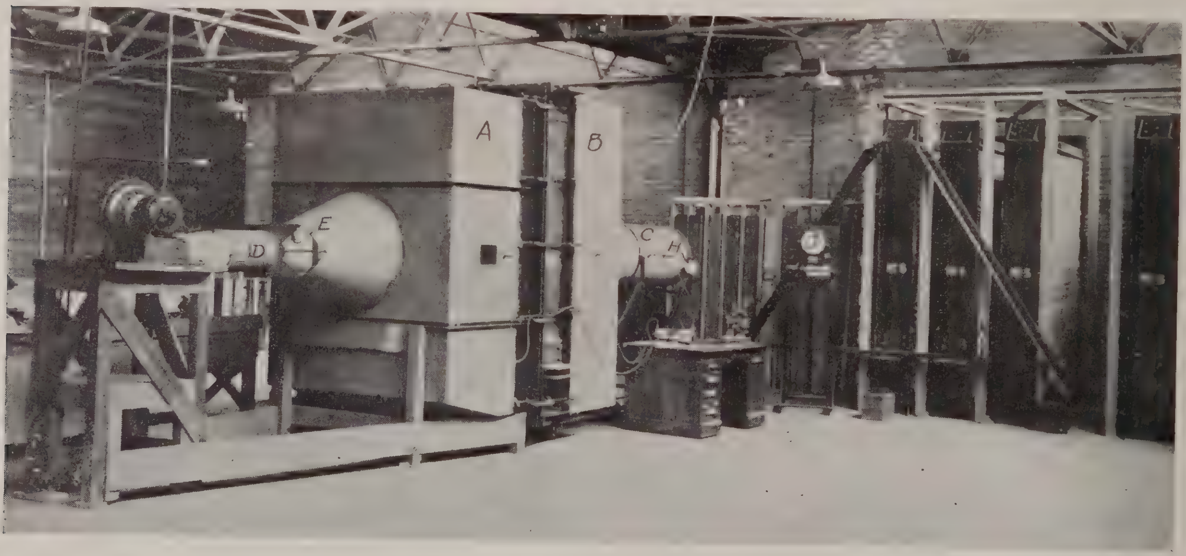
Here are some of the data obtained:

	Conductance	
Construction	As measured	As computed
2¼" T. G., felt, 3/16"slate..	0.36	0.37
1⅜" plaster on wire netting	1.64	1.68
Guaranteed 5-ply roofing, 1¾" pine	0.46	0.48
4" brick, 8" tile, plaster, paint	0.30	0.31
Plaster, 3" gypsum block, plaster	0.87	0.88
13" brick, plaster..........	0.28	0.30
Clapboard, paper, sheathing, studding, lath, plaster, wall paper (which surprised the investigators)..	0.28	0.27
8" concrete slab, 1:2:4 mix..	1.79	1.04
8" concrete slab, 1:2:4 mix..	1.66	1.04
4" brick, 8" tile, plaster....	.60	.31

As might be expected, some unlooked-for results were obtained during a long series of field tests with the heat flow meter. During the study of heat flow through a tile, brick veneer wall, there was a decided drop in temperature, followed by a gradual rise. The low temperature continued over a three-day period. The salient data obtained are given here:

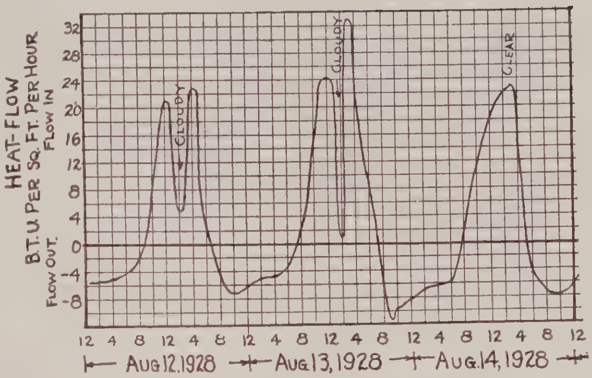
	Jan. 13	Jan. 14	Jan. 15	Jan. 16
Lowest outside temperature	40	23	18	20
Highest rate of heat flow (actual)	9.5	11.4	15.3	15.7
Highest rate of heat flow (theoretical)	8.9	14.0	15.6	15.1
Per cent of theoretical of actual rate of heat flow	93.7	122.1	102.0	96.1
Total heat flow for 12 hrs., (actual)	72.2	122.4	168.3	143.3
Total heat flow for 12 hrs., (theoretical)	106.7	168.0	187.2	153.6
Per cent of theoretical of actual total heat flow..	147.8	137.2	111.2	107.1

It is evident that the maximum measured rate of heat flow increased as the outside temperature



Testing Equipment for Determining Air Flow Through Brick Walls. Several Test Panels Are Shown at Right dropped, but not as rapidly as the theoretical rate of heat flow found by multiplying the conductance of the wall by the temperature difference. When the outside temperature started to rise, the measured rate of flow became greater than the theoretical rate. Lag in heat loss, due to the heat capacity of the wall, caused this condition, which was not fully appreciated until brought to light by these tests. The total heat loss over the 12-hour period as measured was less than the computed loss, based upon a continued maximum temperature difference over the entire period. This condition should be taken into account when estimating heat losses from buildings involving large wall masses capable of storing heat.

Another interesting finding developed through tests on the walls of the Hotel Schenley and of the Schenley Apartments, Pittsburgh, both being 4-inch brick, 8-inch tile and plaster. The conductance of the walls of the former, as determined by the meter, was almost exactly twice that of the latter. A study of the possible reason led to the fact that the heat-flow meter had been applied to a narrow strip of wall in the hotel, with an edge close to a window and another adjacent to a wall. Undoubtedly the lines of heat flow through the wall spread out from the inner to the outer surface, causing the discrepancy. From this, the operators learned to be more careful in choosing a location for the meter. The next year or two undoubtedly will see the accumulation and tabulation of a great many figures that will render more accurate the determination of heat losses from all portions of buildings of every class.



Graphic Record of Heat Flow Through Roof Showing That Cloudiness Reduces Inflow

Insulation. Turning from a classification of heat losses through walls and roofs to the problem of reducing these losses to the economical minimum, there are to be considered three classes of insulation: rigid boards, flexible, and "fills." Each has qualifications for specific applications. Practically every type will absorb water to some extent; and insulation, when moist, ceases, in a large measure, to fulfill its function. Where there is a chance that condensation will occur, some effective waterproofing should be provided. Fire- and vermin-resisting qualities also should be given consideration.

Modern buildings designed for factory or office use usually have so much glass in proportion to wall surface that wall insulation seldom is warranted. The window area may be 60% to 70% of the aggregate exposed wall area, and the heat loss through 1 square foot of glass approximates that through 4 square feet of conventional 13-inch brick construction. So the heat loss through the wall is practically negligible.

It is in the home, where comfort is paramount, that insulation is more than justified. With about one-fifth of the wall surface glass, the remaining wall area is well worth insulating, to say nothing of the roof. A plain brick wall is more of a sieve than is popularly assumed. With a 15-mile wind,

An Early Form of Nicholls Heat Flow Meter Used in Testing Roof

Measuring Heat Flow Through Walls of Hotel Schenley it will pass about 7½ cubic feet of air per square foot per hour. The addition of a coat of plaster on furring will reduce this to one-fifth of a cubic foot. Insulation will reduce this air leakage to an almost negligible amount and, at the same time, reduce the heat loss through the wall.

Workmanship and Heat Loss. A comprehensive series of tests recently has been made at the University of Wisconsin to determine the rate of air infiltration through brick walls of various kinds. An elaborate test equipment was so constructed that sample sections of wall could be inserted between two air chambers, with all peripheral joints thoroughly calked. Air pressure was produced in one of the chambers by a blower, and the air that passed through the wall into the other chamber was emitted through small calibrated orifices and its quantity measured.

Test wall sections were built up of two classes of brick,—hard and soft,—and in such a way as to differentiate between good and poor workmanship; in the latter, the mortar was "skimped" between the two outside surfaces of the wall, *but the outside appearance was identical.* Great variation was found in the air-passing character of the different walls. Careful analysis of a mass of data showed that there were many factors, and that reasons for certain results were more conjecture than anything else. Of the results, Professor Larson says:

"Since poor workmanship consists mainly in leaving voids between the bricks in the interior of the wall, and since the porous brick is likely to be much less uniform in density, it may be that poor workmanship opens up passageways for air through short distances from the face of the porous brick to the voids, and then out on the other face of the wall through a short distance of brick. This explanation requires that the hard brick wall passes most of the total infiltration through the mortar joints."

"Another possible cause for this greater variation between the best and the poorest of porous brick walls, as compared to the best and poorest hard brick walls is in the effect of the porosity of the brick on the proper setting of the mortar. It is likely that the porous brick draws the water from the mortar before it has had time to set, and consequently causes an opening of pores and shrinking away of mortar from the brick surfaces."

It will be evident that the architect, by insisting on the highest class of workmanship and materials, and by watchful inspection during the construction of brick walls, can insure to his client walls that will pass a minimum of air, and consequently result in materially reduced fuel bills and provide more comfort for the occupants.

That the economic thickness of insulation can be determined from essential data is shown in a typical analysis recently made by M. S. Wunderlich, in which he assumed:

An annual heat demand of 6,000 degree days.
Anthracite coal at $17.00 per ton.
Coke at $12.50 per ton.
Bituminous coal at $9.00 per ton.
½-inch insulation at $90.00 per 1,000 sq. ft., applied.
1-inch insulation at $130.00 per 1,000 sq. ft., applied, and where 1-inch insulation is applied to side walls, $15.00 is added per 1,000 sq. ft. to take care of additional depth of window and door frames, the insulation being installed to take advantage of air spaces and having a conductance of 0.30 per unit inch.

The conclusions drawn by Mr. Wunderlich are thus summed up:

"From this table it will be evident that the saving with 1-inch insulation in the ceiling, with $17.00 per ton coal, is slightly greater than the saving with ½-inch insulation in the side walls, and that with $9.00 per ton coal the saving with 1-inch insulation in the ceiling is slightly less than the ½-inch insulation in the side wall, while with $12.50 per ton coke the saving is the same. This would indicate that with a higher fuel cost the insulation in the ceiling should be increased over that indicated as compared with side walls, and that with $9.00 per ton coal the thickness of the ceiling insulation approaches the thickness of insulation of the sidewall. Therefore, it follows with the average cost of fuel to the home owner, that the ratio of ½-inch insulation in the side walls to 1-inch insulation in the ceiling is a well balanced insulated job."

A HOUSE FOR MASS PRODUCTION

BY

R. BUCKMINSTER FULLER

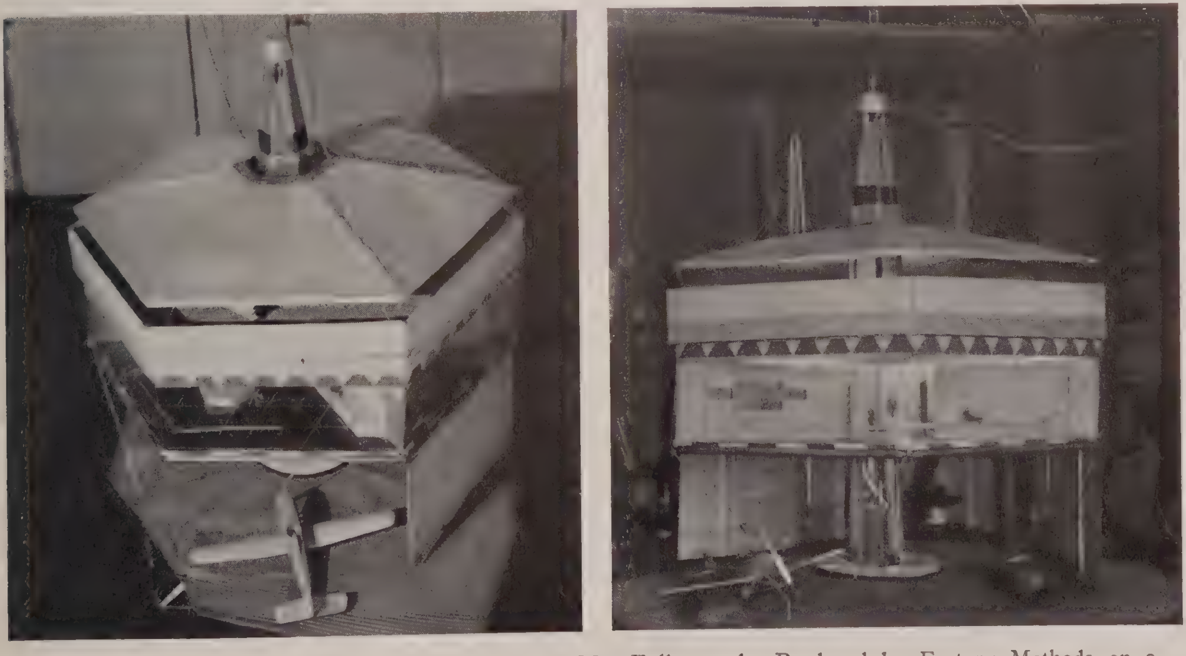
Editor's Note. The brief but illuminating and stimulating description of this house is taken largely from an address by Mr. Fuller, in Chicago, where his models were first exhibited.

IT must be clearly understood that the models and drawings here presented are in no way assuming of perfection or that they indicate the only solution of a problem. They do, however, represent a very definite attempt at housing design on a 'best-for-all' basis, with no concession to material appearance or to vanity in advance of proper engineering and general scientific solution. By vanity is meant an association of ideas as to how something should be done because in the past a solution has been related to some event or person of whom we are fond, rather than to solving problems on the basis of their clearest reference to intelligence.

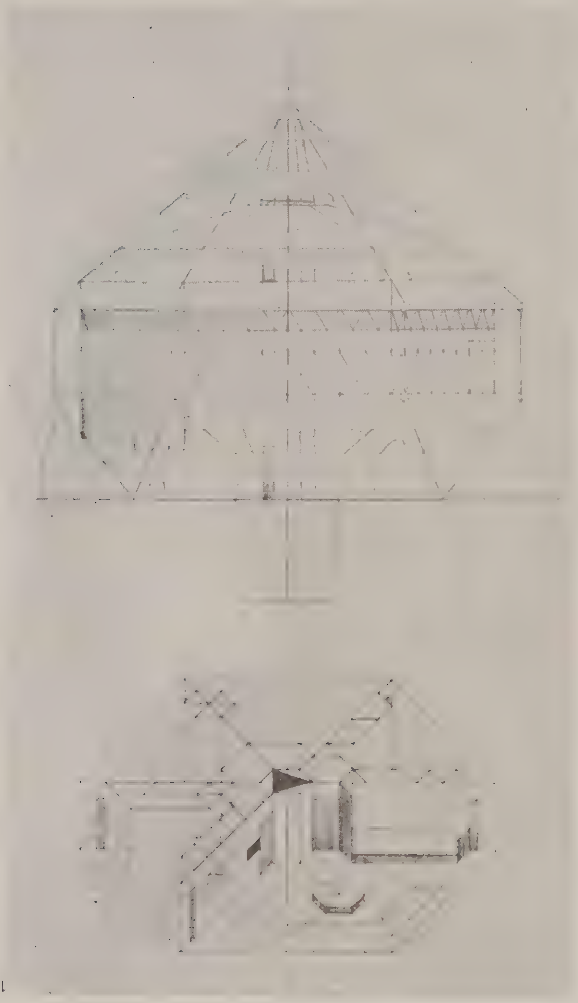
"Inasmuch as the major abode of the United States,—and it is assumed for discussion that the United States represents the advanced nations of the world,—is still the five-room individual house, and inasmuch as but 1 per cent of the five-room houses are designed by architects, it being economically inexpedient in a 'tailoring' business to design so small an entity, and inasmuch as the majority of these individual houses of the United States have still no bathrooms, there is indeed involved a problem of industrial best-for-all design.

"That there are 2,000,000 people who die in houses annually from floods, earthquakes and tornadoes, that there are multi-millions who die from unsanitary housing conditions, all of which can be overcome mechanically with no effort at all, indeed emphasizes the problem that there is a best-for-all solution. Inasmuch as we are all here in this world to live, and the one thing we need most is housing, housing on an industrial basis of fabrication, as opposed to the picayune 'tailoring' business it is today, would be in proportion to all other businesses as the battleship to a small boat. It has been found that the great popular buyers for monkey wrenches, automobiles, hats, etc., cannot purchase housing as they want it, there being no centralized industries on a universal competitive basis to overcome the exigencies enumerated before, to economically survive on their claim that they can overcome them, and so perform.

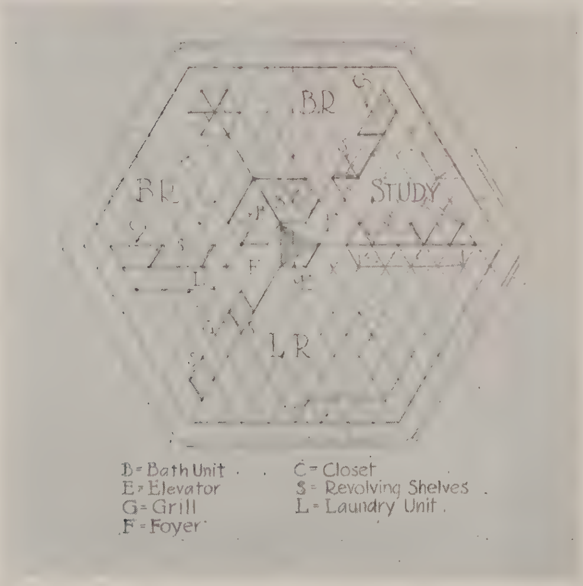
"This house is 40 feet high, 50 feet in diameter, proof against earthquake, flood, tornado, electrical storms, marauders, etc. It contains two bedrooms, each with its bath; foolproof worm-gear elevator; laundry unit in which each piece of soiled clothing is individually deposited, and completely finished and ready to use in 3 minutes; cooking grills which are like a piano and



Two Views of a Model of the House Designed by Mr. Fuller to be Produced by Factory Methods on a Quantity Production Basis



Elevation and Isometric Drawing of the Dymaxion House, Showing Stability of Construction Obtained by Triangulation of Steel in Tension



Plan of Dymaxion House Having Living Room, Study, Bedrooms with Baths, and Service Room

have nothing to do with a servant; refrigerator; dish closets in which the shelves come around to one instead of one's going around for them! incinerator pocket in which one shells the peas, etc., without ducking down under the pipes; pneumatic, soundproof floors and doors on which the children cannot hurt themselves; library in which the bookshelves come around to one, completely equipped with maps, globes, atlases, drawing board, typewriter, mimeograph, calculating machines, television unit, radio loud speaker and microphone; individual power plant providing both light and heat; sewerage disposal; compressed air cleaner; pneumatic beds; built-in furniture; semi-circular hanging coat closets with capacity of 32 overcoats or 50 dresses; hangar in which the transport unit, an amphibian airplane-automobile, is found as part of the equipment of the house; a 50-foot diameter play deck on top of the house sheltered from storms but where sun baths may always be had; windows that cannot be broken and are never opened, as the air is brought in mechanically without losing any of its fresh, spring smell, but freed of all dust and combined with the proper amount of humidity,—air never too wet nor too dry—and of the proper temperature, blown in through the rooms so that at the North Pole or at the equator no bed clothes need ever be used as the air is always perfect; where any amount of light or coloring of the light may be had in any room from completely indirect, translucent lighting of ceilings or partitions; rooms that are all soundproof so that when anyone rests he may rest in perfect peace. All delivered and ready to move into complete as described, it weighs but 6,000 pounds; at 50 cents a pound for this combination of conveniences, which involves aluminum, casein, etc., it comes to but $3,000 delivered. This house, apparently from cost of Diesel engine operation figures now current, can be maintained at a total expenditure of $5 a month. Being on a functional basis of design, like a ship, it can now be sold not on the land it occupies any more than the ship on the water it occupies, but on the acceptance time-faith basis of all other products.

"It is evident to all the most ardent æsthetes that such truth can also be beautiful. With such apparent results to be obtained on a best-for-all basis, it is evident that should the great industrial housing so indicated develop, which it must inevitably do, all other forms of housing extant will be obsolete and we will need at once 2,000,000,000 houses, let alone factories, office buildings, etc., of equivalent economic engineering economy, wherefore none need fear of being bereft of their business provided they realize that good prestige and organization, rather than material inventory, form their chief stock in trade."

PHOTO-VISUALIZING FOR ARCHITECTS

BY

LEICESTER K. DAVIS

ILLUSTRATED FROM PHOTOGRAPHS BY THE AUTHOR

NOT for one moment is this article intended to go on record as recommending that survey photographs be made to take the place of professionally produced progress pictures which are now so thoroughly relied upon for records of the major phases of modern construction. The points which it emphasizes are meant solely to aid those who have need of accurate visualizations of subjects which cannot wait for, or perhaps do not justify employment of, the commercial camera man's skill and equipment.

Architects and engineers, construction superintendents and field investigators have assured me that failure on their part to make more use of the little camera as a survey instrument has been due merely to not knowing "how it should be done." Time and again there is need of visual surveys: records of structural practice; details of construction rapidly assuming change of form or being lost to view beneath concrete, brick or plaster; good and bad methods of handling or storing material; incidents which to be of practical value as part of reference data must be secured on the spot, without delay. "I've tried making such photographs," one architect recently said to me, "but with very few exceptions, results haven't justified the bother of lugging a camera about. Most of my stuff has come out all wrong,—important details lost in inky shadows, craftsmen in action looking like woolly dolls, close-ups that make your eyes ache trying to see what they are all about, and distortion that's like a bad dream. It simply can't be done,—by me at least."

It can be done, however, and should be by every architect, engineer or supervisor who knows the value of recorded day-to-day impressions that only a clean-cut photograph can give as irrefutable evidence for future reference. To back that assertion, let's begin with consideration of the qualities demanded in such photographs.

Pictorial effects have no place in the photograph that's intended to become part of a permanent record of structural facts. Niceties of composition, intriguing play of lights and shadows, have no value. Detail is what we are after, —all of it that can be secured, with identity and relationship of elements made clear and brought out needle-sharp, and faults of material or method shown beyond a shadow of doubt.

"That's all true enough," says the man who consistently has had the reverse of such results. "I know as well as you do what makes a successful survey photograph, but how would you handle a problem like this? I want for my files a picture of methods employed on an installation that's in progress. In another half-day it will be out of sight behind courses of brick. I've a particular reason for wishing to show the workmen on the job in action and unaware that a photograph is being taken. It's a dark day with rain, and never a chance for a peep of sunlight. And to get this picture I've got to perch on a scaffold, 20 feet from my subject. That's a fair sample of actual conditions *I've* been up against." A creditable survey shot in a situation such as that would be hopeless if attempted with equipment of insufficient capabilities, but it would be no problem at all with the right sort of camera. To prove that, before we go further, just examine, on page 106, a reproduction of an actual survey photograph made in the rain, under light conditions worse if anything than those just described. No one could wish for more detail, particularly in the heavily shadowed portions. This photograph was made during an inspection trip with a little camera not much larger than a notebook, taking a 2¼ x 3¼-inch picture. Its ability to do the work lay, of course, in better than average lens and shutter,—in a lens having reserve speed enabling it to register details in low visibility, and a shutter adjustable to the exact timing required.

The Lens. The average individual whose experience in photography hasn't gone much beyond the "press the button" stage is far from being certain as to what is meant by "speed" in a lens. Usually he has a hazy idea that it is associated with some special form of grinding or quality of glass peculiar to its type. If at all familiar with the numbers by which lens speed is designated, he realizes that "f:4.5" means an extremely fast lens, while "f:5.6" or "f:7.7" is considerably slower. Beyond that he is not sure as to what it is all about. A good many architects and others who are interested in survey photography, purely as a means to an end, have been surprised to learn that, broadly speaking, the speed of a lens is gauged by the amount of light which it admits to the emulsion-coated film on which the latent image is formed during exposure. A lens is numbered according to the ratio of the diameter of its full aperture to its focal length. For example, the diameter of an f:4.5 will, at full opening, divide exactly 4.5 times into the focal length of the camera for which it is intended, while a slower lens will be of smaller proportionate diameter. This does not mean that mere ability to admit a great amount of light makes a fast lens perfect in its recording. With speed as just

The Little Camera Which Made the Illustrations for this Article. Exposure Meter, Supplementary Lenses, Color Filter and Range Finder Also Shown

defined, there must be refractive qualities that correct aberration and distortion, eliminate chromatic blur and other errors far too technical for discussion here.

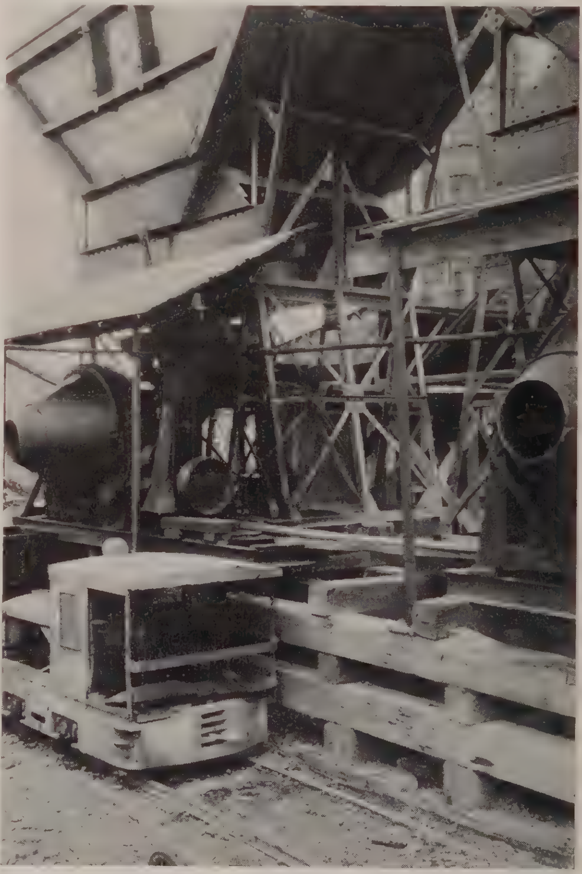
The point to be emphasized is that the faster the lens,—considering performance strictly in terms of light,—the greater will be its latitude for effective operation on badly lighted subjects. Correct refraction is quite as important as high speed. No qualities of depth and definition can be too good. For all-round performance under exacting conditions, I can unhesitatingly recommend the Carl Zeiss "f :4.5 Tessar" as being the ideal type for survey work; with its speed are flatness of field, depth, covering power, definition, precision.

Exposure. Correct exposures are, of course, necessary for the success of survey photographs. They must be timed for the details which are most wanted in the finished print or enlargement. The gauging of exposure,—determination of just what fraction of a second or number of seconds are required to get the details,—has made survey photography discouraging to many an architect and engineer whose records might otherwise be crammed with invaluable visual data. Here again, equipment of capacity unequal to demands made upon it has been to blame for a large percentage of failures.

There are several outstanding factors concerning exposure which should be understood. Generally speaking, a survey photograph has to be taken as rapidly as possible. With most views the use of a tripod is both inexpedient and a nuisance. Nine times out of ten there is fast or slow motion as well as fixed detail to be recorded, and the exposure must stop the one while securing the other.

Shutters. With correct analysis of the light with which we are working, there must be latitude in shutter speed that copes with every situation. A shutter of average snapshot limitations falls far short of requirements. As proof of this, suppose one has a camera with shutter adjustable to the usual 1/25-second, 1/50-second and 1/100-second instantaneous range. These will do nicely for everyday amateur picture taking. With an f :4.5 lens wide open it is possible to secure very fair records of street scenes, if not too close upon pedestrians and vehicles, on a cloudy day at 1/25-second. In better light faster action may be stopped by using 1/50-second, while, with light conditions being equal, some very fast action may be stopped at 1/100-second. These divisions are inadequate, however, where bad lighting and motion require timing that borders upon actual time-exposure, or when in brilliant light there is action of "newspaper speed" variety to be stopped.

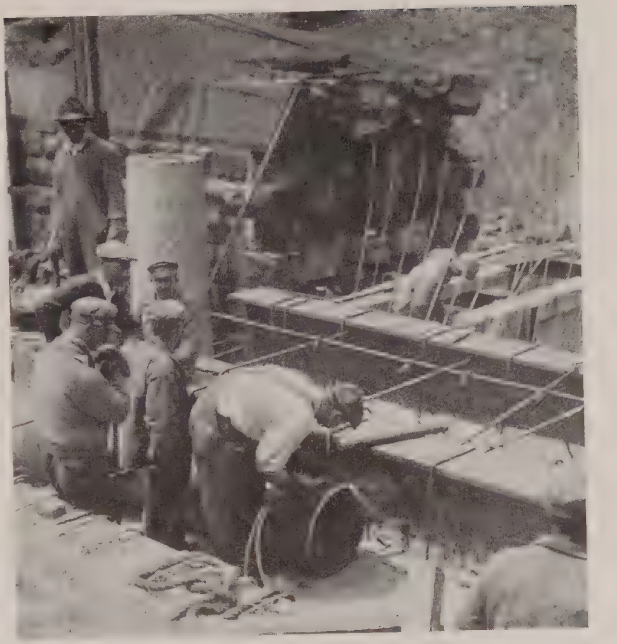
The shutter of the camera selected for survey work should have, in addition to at least 1/200-second maximum speed, a variety of in-between adjustments slower than 1/25-second in order to



A Fast Lens and Slow Instantaneous Exposure Secured This Sharp Result on a Dark, Rainy Day go the limit when necessary. The "Compur" shutter of the little camera with which all the accompanying illustrations were made offers a choice of eight instantaneous timings: 1-second, 1/2-second, 1/5-second, 1/10-second, 1/25-second, 1/50-second, 1/100-second, and 1/250-second. I find repeated use for all of them. Coupled with the reserve speed of the f:4.5 Tessar, they make few and far between the survey pictures which have to be passed by because of faulty light.

Of course, one must bear in mind that working at slow exposures calls for extreme steadiness of the camera,—1/25-second might be set as the deadline beyond which there is risk of hand or body tremor causing blur in the negative. In some instances, where exigency has demanded a hand-held snap or no picture at all, I have secured remarkably clear and fully timed negatives at 1 1/10-seconds. In others, where the passing of heavy trucks, the grind of nearby machinery, or the shaking of a scaffold under wind pressure has caused vibration, 1/25-second has not been fast enough to prevent disappointing fuzziness of outlines. When vibration or unsteadiness of hand or body is at all suspected, it is well to work with the shutter set at 1/50-second or faster, and if in poor light to open up to a lens aperture that calls on whatever lens reserve is required. Experience has taught me the wisdom of securing as firm a camera support as possible for all exposures slower than 1/25-second. The folding strut beneath the lens board of most small cameras usually makes it easy to find a foothold on some rigid object from which focus and exposure may be made with assurance that all movement has been eliminated.

Close-ups of Details Such as This to be of Real Value Call for Critical Estimate of Distance



This Sharply Angled Shot at 25 Feet Would Have Been Hard to Get Without the Aid of the Eye-level Focusing Frame

Photographing Motion. It is sometimes surprising to those who haven't figured the thing out how well fast-moving distant or semi-distant objects may be stopped by an exposure that is apparently much too slow for the task. Not long ago, I made an overhead shot of an army airplane laying a smoke screen at well over 150 miles per hour. Just what its altitude above me was I could not say. But through the wire focusing frame the airplane was tiny indeed. At closer range, as any news photographer would tell one, a wide open f:4.5 and many hundredths of a second focal plane exposure would have been required. My lens diaphragm happened to be set at f:8, with shutter working at 1/100-second. There was no time to make readjustment to higher speeds, so I made the attempt, hoping to stop the smoke trail but having no idea that the plane would be more than a blurred speck. The result amazed me; enlarged from the 2¼ x 3¼-inch negative, that plane stood forth as though it had been cut out and pasted on the print. Magnified under an ordinary reading glass, the rods and wheels of its landing gear were sharp and clear.

Some Structural Elements Call for Exposures That Disregard Unimportant Objects. Note Clearness of Essential Details

This instance is cited because of its bearing on those slow exposures where the survey subjects include distant or semi-distant objects moving too fast for close recording. The explanation, given by rule and formula, is, of course, that motion upon the film surface is proportionate to the distance of the object from the film. My airplane experience has stood me in good stead many a time since, when 1/10-second or even 1/5-second exposures made necessary by heavily overcast skies have recorded rapid motion *at a distance,* enlargement later bringing up the details to the size required for reference use.

Essentials for Architectural Photography. Research in photography has been quite as exhaustive as in other major sciences. It has established laws and has reduced them to rules which may be easily understood and followed by anyone. Boiled down to essentials, there are but three points on which the architect who wishes to make successful visual surveys needs to be thoroughly assured. These are: (1) that the lens of his camera be capable of admitting sufficient light for the film to "see" the details he desires in good light and bad; (2) that the lens be capable of refracting the lines, planes and colors of the object with fidelity and freedom from aberration and distortion; (3) that the shutter which regulates the volume of light required to form the image may be so adjusted that the aperture keeps the amount of light static despite changes in exposure time.

Focusing. The most important requirements in lens and shutter have already been discussed. The final element to be considered is focus, produced by the forward and backward movement of the lens and shutter assembly, required to register subjects at different distances sharply on the film. There is no need to go into the principles and laws which govern refraction, conjugates, bending of light waves, circles of confusion and what not. It is enough to say that the distance of lens from object determines the extension of bellows necessary for an image in critical focus. On the baseboard of one's camera, below an indicator attached to the lens carrier, is the scale which shows what extension must be made to insure sharp focus of objects at various distances. At the start of this scale, where the indicator rests when the bellows are at normal open position, will be found a marking ("Inf." or "Infinity") at which all objects beyond a definite distance will be critically sharp. On the type of camera which is here illustrated, the lens is rated as having 4¼-inch focal length; that is, with bellows at normal extension the lens is at Infinity focus, 4¼ inches away from the film surface. With such a focal length, Infinity begins at about 40 feet, all objects from one-half that distance on being sharp.

Infinity distances vary with focal lengths; the greater the focal length, the greater the distance at which Infinity begins. The ability of the camera of short focal length to perform as a fixed focus instrument at comparatively short range is, of course, a recommendation for its use on surveys. It is hardly necessary to add that the survey photographer should be thoroughly familiar with the focal length of his camera before he takes the field. Little more than these few facts would have to be known were it possible to confine survey photographs to subjects at Infinity. Some of the most important shots, however, must be made at distances shorter than 40 or even 20 feet, and for these detail must be as sharp as possible.

The focusing scale is intended to provide for these close-ups, and it does. But it does not tell one that the moment the lens moves forward of the Infinity mark it has lost ability to register unlimited focal depth. Only so far and no farther, depending upon the point at which the indicator is stopped, will the distances before and beyond the object produce sharply focused images. The more the lens is advanced, the shorter these distances become. It would be bewildering if this information and nothing more were given as an aid to close-up focusing where it is not possible to see on the ground glass exactly what will be secured in the negative. Luckily, it has all been worked out by formulæ. These have been tabulated for easy and accurate reference in compact little depth-of-focus charts which show at a glance the depth of critical focus before and beyond objects at given distances, with lenses of different focal length, working at various apertures.

In making a photograph of a structural element at, say, 15 feet, with the diaphragm of a 5 5/16-inch lens set at f:6.3, the depth-of-focus table will tell one immediately that from such a combination one may expect sharp focus from 12 feet, 11 inches to 17 feet, 10 inches, while for the same lens reduced to f:16 these distances will be 10 feet, 9 inches to 24 feet, 10 inches.

In survey photography many subjects are met with in which the principal object desired is closer than Infinity distance, while others almost equally important extend far beyond the limits imposed by the depth of focus rule. An example of this would be a structural element at 15 feet from the lens, with desired contributing elements 100 feet or so beyond. The difficulty is easily overcome, for the Infinity point may be brought nearer than normal by establishing a hyperfocal point beginning at half its distance before the object and extending far beyond.

While in theory such a thing as fixed focus is an impossibility, every lens aperture has its hyperfocal distance, beyond which all objects will be sufficiently sharp for practical purposes. This distance may be determined either by ground glass or focusing scale. With hand-held cameras it may be worked out by a simple formula: the diameter of the aperture desired multiplied by the focal length of the lens and the product divided by 100 for average detail, or 200 if extremely critical definition is required. To the quotient is added the focal length, the sum being the exact distance of the object upon which the lens must be accurately focused to insure far and near sharpness. Handy little tables have been prepared which give all this information at a glance. Their advantages are obvious, when one realizes that with our little camera of 4¼-inch focal length opened at f:5.6 aperture and focusing scale set at 27 feet, everything wished for in the negative will be secured from 13½ feet on.

Judging Exposure. There should be no guesswork as to exposure where a variety of subjects under different light conditions are encountered. Even the experienced professional photographer is often puzzled in determining just how much or how little light of photographic quality he has to deal with. Time of year, atmospheric haze, color, nearness of objects, absorption of light by surrounding objects, and reflected light are all factors having direct bearing upon correct timing. It is also important that the exposure calculation be based upon the light reflected by the object itself and not by surrounding objects.

A Long Range Shot at 1/50 Second Proving That a 2¼ x 3¼-inch Negative Can Record the Facts

There are several types of exposure meters which make possible quick and accurate calculations. These may be roughly classified as: (1) card meters, which give close approximations of the light and subjects present, with proper exposures given for full range of apertures and shutter settings; and (2) extinction meters, which are sighted directly upon the object and manipulated until the light admitted by the eyepiece is reduced to proper exposure point, readings being taken from the instrument. My own preference is for either a "Diaphot" or a "Justophot," both of which are of the extinction type. The former is quite inexpensive, handy in size, and once its extinction point is understood, it will be found dependable for interior or exterior use. The Justophot is more precise in its calculations, eliminating all chance of error, no matter how difficult the subject or its lighting.

Whatever means are employed in figuring out exposure, it is well to bear in mind the axiom: "Expose for the shadows, and let the high lights take care of themselves." If after detail, one must be sure to time the shot to get it on the negative. The emulsions of modern films and plates provide a surprising latitude in the matter of exposure; so it is better to err on the side of too much time rather than too little.

Distance gauging is not likely to be a great problem to men experienced in making rapid approximation of measurements. It is nevertheless well to be provided with a dependable range finder for close-ups that require critical definition. There are several types which give most satisfactory results,—compact little instruments not much larger than a cigarette lighter, requiring but rapid sighting and a finger and thumb turn of a calibrated dial to obtain readings of from 4 to 100 feet. A range finder will also be found quite valuable in making distance approximations where a tape is not available or practicable.

The Camera. And now for a brief consideration of the camera itself with which to make good survey photographs. Compactness, completeness, and ease of manipulation are equally important. After experience with various makes and types, my choice has settled upon the little camera here shown. It has everything and more to be desired by the architect, engineer or structural supervisor. Closed, its outside dimensions are but 7 x 3½ x 1½ inches. It weighs a trifle more than a pound, and its capabilities and adaptability extend to the most complicated forms of visual survey making. It is, of course, equipped with the f:4.5 Tessar lens and the Compur shutter already described. With these are included several features which make immediate appeal. The foremost perhaps is the "Iconometer" focusing frame, which swings out from and moves with the lens and shutter assembly. Through it the operator may view and compose his picture at architectural eye level, or standing point, up to and through the instant of exposure. There is also a brilliant reflecting finder adjustable to vertical and horizontal views, but on survey work the Iconometer will be much more frequently called into play. In fact, many a sharply-angled downward slant, over a scaffold's edge or into an excavation, would be next to impossible without it.

The rising front of this little camera is also of considerable importance. A simple finger and thumb control raises and lowers the lens and shutter assembly at will, increasing or decreasing the amount of foreground and helping to obviate distortion caused by tilting the camera. The hooded focusing back attachment, double extension of bellows, convertibility to roll film, film pack, cut film or plate, and adaptability to wide-angle and telephoto work through the use of supplementary lenses, are other features seldom found in a camera of such small size.

What the average "snapshotter" usually considers to be poor lighting is often an advantage to the survey photographer. As a matter of fact, I try when possible for a slightly overcast day on work requiring exterior views of construction. Brilliant sunshine may be fine for simple record pictures or contrasty pictorial effects, but with structural elements it is quite another matter. "Expose for the shadows and let the high lights take care of themselves," but, as with all rules, this rule has its exceptions. To pierce the inky blackness cast by glittering sunlight upon a complicated structural detail half in and half out of shadows, and to expect a satisfying approximation of correct values, is asking too much of even the long-range emulsions found in modern films and plates. One will get one or the other, depending upon which one has time for, but there is small chance of getting both with the even balance of detail a good visual survey should have. Slightly overcast skies help matters mightily, and if one has the right sort of lens and shutter combination, there need be no worry about getting a good exposure on a bad day, provided it be at effective shutter speed.

Wide Angle and Telephoto Work. There are times when even an f:4.5 lens must have assistance. I speak particularly in reference to subjects which require a much wider angle of view than is made possible with the Tessar used alone. For this, a little wide-angle attachment becomes a very welcome accessory. It is slipped over the mount of the Tessar, shortening the focal length considerably and widening the angle of view in a most satisfactory manner. In such cases use of the ground glass becomes necessary, but this is made easy by the focusing back of the little camera just described. Supplementary lenses for telephoto work may also be used, making possible close-ups of distant and semi-distant objects which could be had in no other way.

A good filter should be part of the survey photo fitted kit. This, too, is slipped over the regular lens. Filter action slows up the ultra-violet rays which normally register far ahead of colors farther down the spectrum. Used in connection with panchromatic plates or films, a filter brings out reds and yellows which otherwise would be expressed in tones far darker than the originals. Used with ordinary films or film packs,—which now possess a high degree of color perception,—a light yellow filter will do much toward snapping out the contrasts of surfaces on which there is an abundance of reds and yellows. A filter increases exposure in ratio to its factor; that is, a 5-time filter lengthens normal exposure by just that many times; and except under the most brilliant light conditions, with lens at wide apertures, it is seldom feasible to use a filter without a tripod or other fixed support. A tripod should be carried.

CHOOSING THE STRUCTURAL SYSTEM AND MATERIAL

PART III—FLOORS AND ROOFS

BY

THEODORE CRANE

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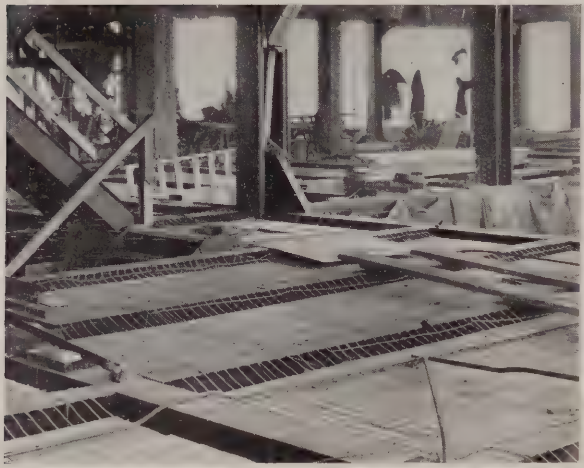
ONE of the most important problems facing the designer of fire-resistant buildings is the choice of the floor construction to meet the particular requirements of his project. It is not the intention of this article to describe all of the various systems that have been devised, but rather to deal with the special characteristics of those most widely accepted, and to point out their respective advantages and limitations.

Let us consider the problem at the moment when the architect's preliminary sketches have been approved and it is necessary to determine the structural design of the floors and roof. We can safely assume that the location and type of occupancy are known. The general dimensions of the building, the lengths of the spans and the proportions of the bays, are evident from the preliminary drawings. The locality determines the building ordinance which must be adhered to, or the architect develops his own standard for the structural design, based on his knowledge of what constitutes good practice.

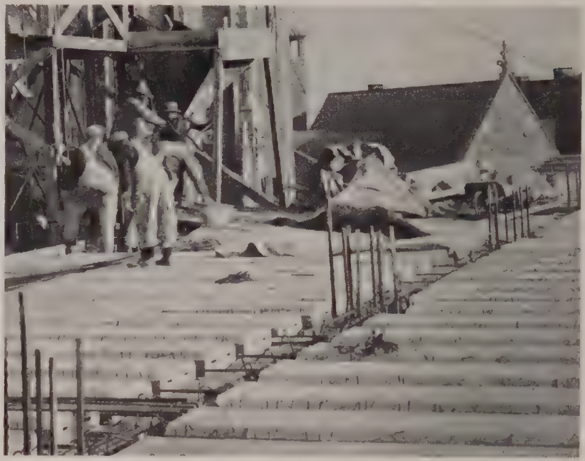
In the larger buildings the first step in structural design is to make a tentative choice between a reinforced concrete and a steel frame. This is important, since some floor systems are not suited to both. Even if the building is a low structure with bearing walls, the framing of the interior will be of either of some form of steel or reinforced concrete, except in rare instances where bearing partitions may be used. If steel is employed, there are a number of floor systems covering a wide range of applicability. Prominent among these, in the east, is the so-called "cinder arch," which has been used extensively in New York. The present municipal ordinance covering this system went into effect about 13 years ago, and it permits 4-inch cinder concrete slabs, properly reinforced, to be used in fire-resistant buildings for clear spans of up to 8 feet. As a 16-foot column spacing would be too close for economy, and as furthermore it would result in placing a concentration on the center of the girder, the almost universal practice is to space columns up to 24 feet and to bring the beams onto the girders at the third points. This system is particularly economical in New York, where neither the code nor department ruling has placed any limiting value on the load per square foot that may be carried by a 4-inch slab, provided that the sectional area of steel reinforcement meets the requirement of the empirical formula. General practice would seem to allow anything up to about 300 pounds per square foot, which is the sidewalk requirement. The concrete functions principally as a stiffener for the suspended mesh.

Cinder Concrete. To what extent we are justified in the structural use of cinder concrete depends upon the character of the materials, workmanship and exposure. Good work can be done with clean, anthracite cinders, and there is no evidence that the reinforcement corrodes in dry locations. Unfortunately, much of the cinder concrete now being placed, on even large structures, is neither well mixed nor thoroughly compacted. Furthermore, the structural slab is often screeded off level with the top flanges of the steel beams, which practice permits the cinder fill to come into direct contact with the wire reinforcement which, of course, passes over these supports. Presuming that a well proportioned cinder concrete offers some protection against corrosion, it would seem desirable to raise the slab sufficiently to give at least a 1-inch thickness over the metal. Aside from these criticisms, however, and the propriety of using cinder concrete in buildings referred to by their owners as "monumental," it is a type of construction which has undoubtedly proved both economical and satisfactory with steel frames. But it should be remembered that in cities such as New York, where many firms of subcontractors have specialized in laying "floor arches," the price per square foot is much less than could be expected in many localities.

Ribbed Floor Systems. Whereas the use of cinder concrete is principally confined to certain large centers, various types of ribbed floor construction are widely used throughout the country. These originally developed from the solid concrete slab by the simple expedient of replacing the concrete in the lower portion of the slab with fillers, such as terra cotta or gypsum block, or by framing voids with wood or metal pans. As this portion of the slab, being below the neutral surface, carries no compression except over supports, it is quite practical to concentrate the reinforcement in ribs spaced from 16 inches up to several feet on centers, and to design the latter of sufficient width to properly enclose the steel and provide for shearing stresses. The advantage of this method lies in the reduced dead load. For example, a solid concrete slab 10 inches thick would weigh 120 pounds per square foot; the same thickness, with 8-inch gypsum block fillers and a



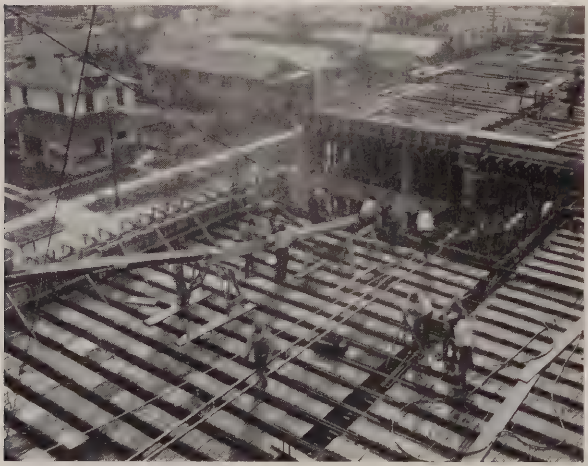
Wire Fabric in Place for the 4-inch Cinder Concrete "Arches" on an Office Building in New York



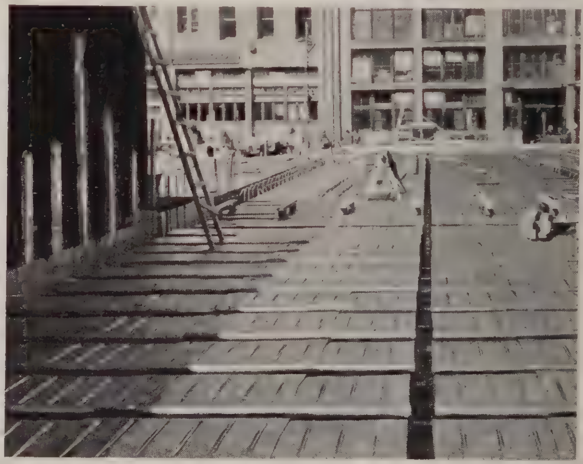
Concrete Rib Construction with Gypsum Block Used As Fillers on a Building in Baltimore

2-inch "topping," would weigh 60 pounds. If it is desired to use a metal lath as a base for ceiling plaster, the metal or wood pans show even greater saving in weight, giving a floor load of only about 50 pounds for the same thickness. On multistory buildings this is a very important matter, as the entire frame, including the footings, can be made correspondingly lighter. This type of floor can be used to advantage with either a structural steel or reinforced concrete frame, and it is particularly suited to comparatively light live loads, ranging from 40 to 90 pounds per square foot, and to long spans of from 18 to 28 feet.

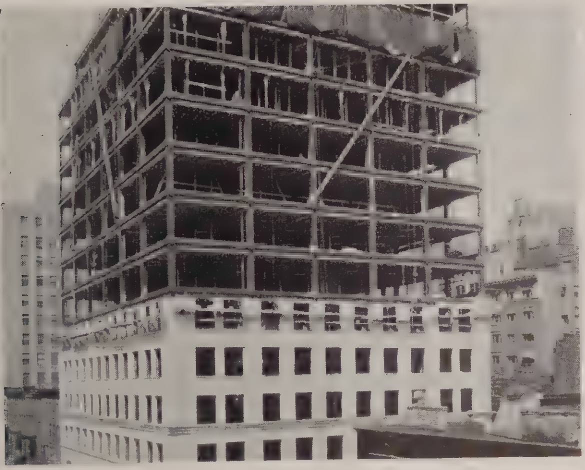
It is futile to make general statements as to the comparative values of the various ribbed systems. From the structural designer's viewpoint, they all have the same characteristics. Ribs, 4 or 5 inches wide, are placed between filler blocks or pans and computed as small, individual T-beams. Many architects consider that the advantage of plastering upon a gypsum or terra cotta surface amply justifies the somewhat greater cost of the block systems, but metal pans are widely and successfully used in all parts of the country. These latter are referred to as of the "removable" or the "permanent" type, depending upon whether they are taken out and re-used or left in place. The reinforcement of the ribs or joists, as they are sometimes called, consists of one or two rods or bars, alternate rods being raised at about the fifth points of continuous spans to resist the tendency of the beam to fail in shear, or more correctly, in diagonal tension. Where light concentrations occur, such as under terra cotta partitions, joists of double width and with twice the typical reinforcement are employed; a "bridging joist" is used near the middle of long spans to give lateral support. It is usually possible to avoid the use of stirrups, as most building codes follow good practice in allowing 60 pounds per square inch in



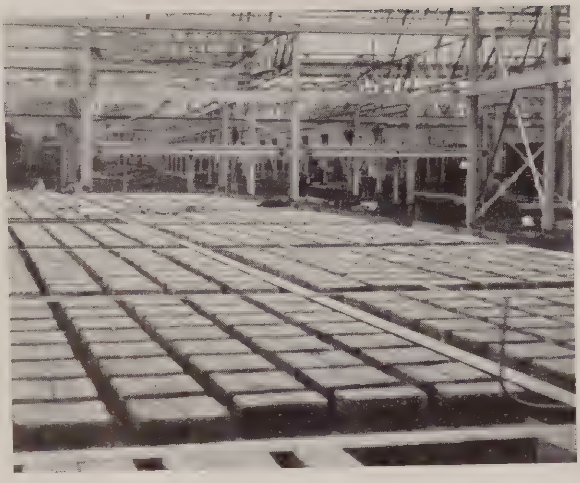
Metal Tile or Permanent "Tin Pans" Ready for the Pouring of the Concrete on a School Building in New Orleans



Removable Pans in Place on a San Francisco Garage; a "Bridging Joist" is Provided Along the Center Line of the Span



Type of Framing Suited to a Two-way Floor System. Necarsulmer & Lehlbach, Architects



Two-way System Formed with Structural Fillers of Slag Concrete; the Panels are Practically Square

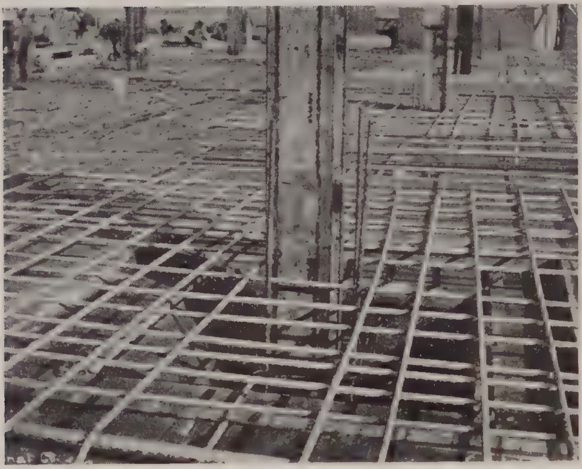
vertical shear where the longitudinal reinforcement is properly anchored. If the shearing stresses are critical, or if the requirements for negative bending moment over continuous supports demand a larger section adjacent to supporting members, it is possible to obtain tapered pans, the use of which results in flaring the ribs. If the design actually requires stirrups, the "continuous" type is probably the more economical.

Over the tops of the terra cotta or gypsum fillers, as well as where metal or wood pans are used, it is customary to place a thin slab of concrete cast integrally with the ribs. The thickness of the slab, referred to as the "topping," is generally specified by code as not less than 2 or 2½ inches. Where the lower limit is sufficient over terra cotta or gypsum block, it would seem desirable to have at least 2½ inches over pan construction. Building ordinances do not usually make this differentiation. Reinforcement, in the form of small rods or wire fabric, is placed in the topping in order to carry the load to the joists and strengthen the slab against stresses due to volumetric changes or impact. The pan systems are particularly adapted to buildings where hung ceilings are necessary in order to provide for ducts.

Two-way Systems. Ribbed floors designed as two-way systems, that is with concrete joists running in two directions, constitute an extremely interesting part of this subject. The steel dome is the two-way application of the principle of the metal pan. The two-way system employing precast concrete or terra cotta blocks between the joists is well known. These are both proprietary designs but have been widely used and with excellent results when the plan of the building and partition arrangement is appropriate for a two-way distribution. Taking advantage of the principles underlying the design of flat plates, which have been studied by many investigators both in this

Typical Reinforced Concrete Beam-and-slab Construction as Designed for a New York Post Office. A. S. Alschuler, Architect

Typical Reinforced Concrete Girderless Floor Construction with Drops Over Columns and Half Drops at Walls. Cass Gilbert, Architect



Typical Arrangement of Reinforcement for the Two-way System of Girderless Construction; the Steel Column Cores Are Used Only Through the Lower Stories of This Warehouse

Typical Light Construction of Pittsburgh Office Building, Showing Pipes Passing Through the Joists and Concrete Carried by Metal Fabric. Joists Are Doubled Under Light Concentrations

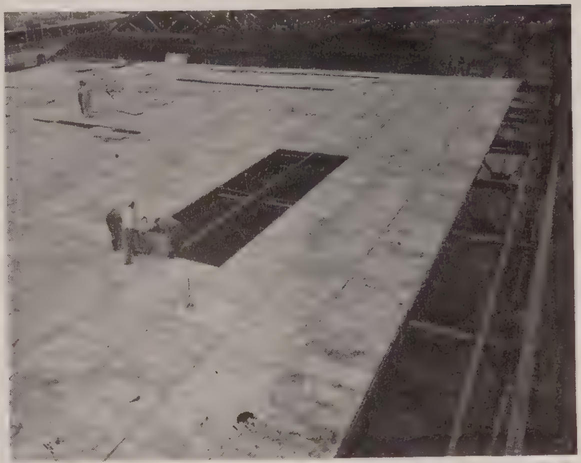
country and abroad, the owners of these systems have gained the approvals of many building departments, and among them those of our largest cities, for the use of empirical coefficients in the moment computations. In the past it has been the practice to compute the sustaining power of a concrete slab of two-way design as if it consisted of a series of parallel beams, entirely neglecting the strength due to "plate action." In the light of both theoretical analyses and practical tests, it would appear justifiable to use moment coefficients on two-way designs 30 per cent less than those that would be applied to individual beams under similar conditions of restraint. In other words, the bending moments on all two-way slabs, of both solid and ribbed construction, might well be approximated as $\frac{WL}{12}$, $\frac{WL}{15}$ and $\frac{WL}{18}$ instead of as $\frac{WL}{8}$, $\frac{WL}{10}$ and $\frac{WL}{12}$ in which W=total load per lineal foot carried in the direction of the reinforcement under design, and L = span as ordinarily defined. As a general principle, it may be borne in mind that when a building can be framed to obtain approximately square bays, with supporting girders or walls on all four sides, there may be a distinct saving in using a two-way system. It can be employed with either bearing walls, steel or concrete frames and have a wide range of application, being suitable for all loads up to those ordinarily used on the floors of buildings intended for light manufacturing purposes.

Light Weight Rolled Steel Sections Used with a Structural Steel Frame

A comparatively new system employing slag block units between concrete ribs, running in two directions, furnishes an economical design falling under this classification. The blocks are made of Portland cement, sand and slag; owing to their strength and comparative lightness, they serve in a structural capacity as well as acting as fillers. A topping of concrete is not necessarily required, but it may be used to give the exact thickness called for by the design. This system is adaptable to either a structural steel or reinforced concrete frame and is particularly economical for light and medium loads. During this year it is being installed in several of the largest hotels in New York.

Beam and Slab. The first type of reinforced concrete floor construction that came into use for other than extremely short spans is known as the "beam and slab." In the typical arrangement, columns are placed on about 20-foot centers; girders run between columns in one direction, usually across the building, and the beams frame into the girders at the third points of their spans. An industrial building designed for a live load of 200 pounds per square foot with bays 20 feet square, would require, approximately, a 4-inch thickness for slabs, supported by beams and girders 8 by 20 inches and 12 by 28 inches, respectively. The depths are taken from the top of the

Pre-cast Concrete Channel Slabs Being Placed Over a Structural Steel Frame on a Detroit Factory



A Large Roof Area of Pre-cast Concrete Slabs Laid Over Railroad Yards in Hoboken

slab. This system is still used for floors built of solid concrete, the arrangement of which does not lend itself to the generally more economical design known as "girderless construction." Obviously, such a system can be adapted only to a concrete frame.

Girderless System. Within recent years beam-and-slab designs have been largely superseded by the girderless type wherever the size of the building and the interior arrangement permit three or more consecutive bays in each direction, provided that the bays are approximately square and of about the same size. This system, however, is not usually economical for live loads of under 100 pounds per square foot, and its particular function is use for industrial buildings and warehouses with live loads ranging from 125 to 300 pounds per square foot of floor area. For the loads ordinarily used in apartment house construction, a pan or ribbed design is more desirable from the viewpoint of structural economy, entirely aside from the architectural difficulty presented by the flared column heads. For industrial buildings designed for a live load of 200 pounds per square foot, and employing drop panels over the columns, the sizes of structural members for a bay 20 feet square would be approximately an 8-inch thickness for the slab; drop panels 6 feet, 8 inches square and projecting 3 inches below the soffit of the slab; column capitals 4 feet, 6 inches in diameter. These dimensions would conform to the requirements of most cities, including New York and Chicago. The girderless system can be used to advantage with either a reinforced concrete frame, which is the usual construction for comparatively low industrial buildings, or with structural steel column cores, which have recently become popular for comparatively tall city buildings.

Light Steel Joists. Passing from the class of heavy concrete construction to that of the lighter sections, we have various types of pressed and rolled steel joists. These are not used to advantage with a concrete frame, and although capable of carrying light manufacturing loads on comparatively short spans, are particularly suited to designs requiring live loads of from 40 pounds to 75 pounds per square foot. Pressed metal joists have been on the market for many years and are used in exactly the same way as wooden joists, except at a somewhat greater spacing, and usually as supports for a 2-inch concrete sub-floor poured on metal lath or similar construction. Recently, the new "light steel joists," which are actually light trusses, have been developed and widely used. This construction is extremely simple, the ends of the joists resting on supporting walls, or steel girders and the upper chords carrying the structural slab which may be of either concrete or gypsum, cast over metal reinforcement. As the joists are of open design, it is possible to conceal pipes within the floor. The plaster of the ceilings is applied to metal lath attached to the lower chords of the joists. The latter are occasionally

Pre-cast Gypsum Floor and Ceiling Blocks Used with Light Weight Rolled Steel Sections

Gypsum Tile Being Placed Over a Structural Steel Frame on a College Building in Illinois

Short Span Gypsum Tile Laid Over a Structural Steel Frame on a Dormitory for Yale University

spot-welded to the upper flanges of the girders, and wire bridging is used to give lateral stiffness. Sometimes more lateral support may be required.

To fill the demand for a strong and rigid floor, yet one of lighter weight than would be obtained with standard sections, there have recently been placed upon the market light weight rolled steel beams which are normally set from 2 to 4 feet apart and used to support slabs of either concrete or gypsum. The latter may be in the form of pre-cast units or poured in place, reinforced with metal lath or mesh. These systems are generally used with structural steel frames, but are also suitable for floors supported by bearing walls.

Non-fireproof Framing. Owing probably to its obvious simplicity, framing the interiors of non-fireproof buildings, having exterior masonry walls, is a subject that has received very little attention. In fact, one often sees wooden posts and girders used in residence construction, with the result that the natural shrinkage of the wood causes the interior of the building to settle appreciably. To minimize this difficulty cast iron columns filled with concrete should be used in place of wooden posts, as the increased cost is negligible. For the main girders, carried by the columns, H-sections with square flanges should be employed for the support of the wooden floor joists. The standard I-beam sections are not very satisfactory, since the lower flange does not give adequate bearing and necessitates either bolting a carrying ledger to the beam, which is somewhat awkward, or the loss of headroom resulting from allowing the joists to rest on the tops of the steel girders, instead of framing into them. The studding of main partitions should, of course, rest directly on the upper flanges of the girders and not upon the joists comprising the floor system. The sizes of wooden floor joists and the requirements for anchorage, or coping and bridging, are of such general knowledge that the subject will not be further treated in these articles.

Fire-resistant Roofs. The design and construction of fire-resistant roofs is a subject that has received considerable study during recent years. It is not a simple matter to build pitched roofs that will satisfy both structural and architectural demands and at the same time be practically fireproof. In ancient and mediæval buildings use of the wooden truss was the only alternative when the architectural treatment made impracticable the employment of vault or dome. Modern practice, however, demands that our monumental buildings be roofed with something more fire-resistant than lead-covered timber frames, and the result has been the employment of structural steel and reinforced concrete. Some years ago there was much talk of building with pre-cast concrete units. This system was actually applied to the walls of a few moderate-sized structures for which large slabs were cast upon the ground and raised into place by means of jacks. Twenty years ago the author worked as assistant superintendent on a large concrete residence, the pitched roof of which was built in this manner. Ridge and rafters were cast in place, after which large concrete slabs were raised from the ground by means of a gin-pole and dropped in place on the supporting members. It is quite possible, with proper care in detailing, to make a satisfactory weathertight and fire-resistant roof in this way, but it cannot be recommended as economical, nor would the concrete surfaces, even when colored, be architecturally acceptable in most cases.

At the present time, structural steel of standard or special sections would seem to be the most desirable for the supporting members of pitched roofs. Welded connections have been found satisfactory, particularly where electric welding was practicable. This method was successfully em-

Gypsum Poured in Place Over a Thin Sheet of Compressed Gypsum Formed This Roof Surface

A Steel Deck Being Laid Over a Structural Steel Frame On An Ohio Factory

ployed for the purpose of attaching the purlins to the rafters, on the steel framed roof of a large dormitory recently built at one of our eastern universities. Several materials, or rather systems, can be used over the steel. For industrial buildings, pre-cast concrete slabs offer a satisfactory surfacing but are not practical as a base for slate or tile. It is also possible to employ terra cotta "book blocks" laid between steel purlins, or pre-cast gypsum blocks. The steel of the roof should be designed to meet the special requirements of the system. These methods are particularly suitable for large roof areas which are not too complicated in design. If gypsum is employed, it is necessary to give the blocks a waterproof coating as soon as laid in order to protect them from moisture before the application of the surfacing material. The individual slabs should be securely anchored to the steel purlins and the joints filled with a gypsum mortar. Another very satisfactory method, which has been successfully applied to the roofs of monumental buildings, is the use of cinder concrete slabs cast in place over the structural steel framing. There is also a choice of various other materials, including gypsum and mixtures containing Portland cement combined with certain light weight aggregates which are suitable for roof work and are placed in a plastic state. When hardened, the cinder or composition slab is coated with a 2-inch layer of a proprietary material, applied like cement mortar, which serves to receive the nails holding the slate or tile in place.

Flat Roofs. A flat or slightly pitched roof offers no particular structural problem. In this case the designer's attention must rather be centered upon making the deck waterproof. The numerous offsets introduced by our so-called "setback" laws, applying in all of the larger cities, have become the rule rather than the exception and are taken care of as a matter of course by the engineer or structural designer. The problem of waterproofing, however, is more often slighted. Specifications seldom fail to properly describe the typical work, but the details of flashings and the proper use of suitable mastics as joint fillers are too often left to the devices of the subcontractor.

Volumetric Changes. In this work, as well as in all else concerned with building construction, it is essential to realize that volumetric changes due to variations in temperature and moisture actually cause appreciable movement in our structures. The hair cracks which are characteristic of concrete and stucco surfaces, when used continuously over an extended area, usually have their counterpart in the joints of brick, terra cotta, natural and artificial stone. If the work is well done, the cracks are too small to cause trouble on unrestrained surfaces; they express what might be called the "respiration" of the building and are hardly more serious than the very measurable lengthening of large concrete structures under the heat of the sun. But the unit, or assembly, as the case may be, must be free to move, or something will break. An actual instance is on record of a cinder concrete roof filling having expanded with sufficient force to shear off a parapet post somewhat over a foot square in horizontal section and reinforced with four ¾-inch rods. Good construction provides a mastic filled joint where materials are capable of expansion about parapets, chimneys or penthouse walls. This has become an established practice. Difficulty arises from much more subtle causes, among which is the contraction of the fluid concrete in the process of hardening. Provision should be made to permit the initial contraction of the concrete without rupture, and the work should be designed to allow each unit freedom to swell and contract with climatic changes which are certain to occur.

These Two Views Illustrate the Use of Reinforced Cinder Concrete Supported by a Structural Steel Frame. At the Right the Concrete Has Been Covered by a 2-inch Thickness of Nailing Material

In most cases it is a mistake to cast long sections of concrete monolithically. The amount of reinforcement used in our industrial buildings, or others with reinforced concrete frames, tends to hold the mass together and to distribute the strains due to secondary stresses, but even for such structures it is desirable to limit the lengths between joints to 300 feet. A complete separation is then made between the two parts; double columns are constructed on the exterior, and the floor slabs are built as cantilevers on each side of a transverse joint, passing entirely across the building from the top of the footings to the roof, where the parapet and roof slab are also divided. Retaining walls, particularly those used in landscape work, often show signs of disintegration or develop serious cracks after only a few years' exposure. Although there are usually contributary causes, most difficulty is due to two factors,—faulty design in not providing properly for volumetric changes, and faulty construction which results in porous concrete. Both of these evils are preventable, and we all know that excellent results can be obtained in concrete if the work is properly designed and conscientiously built. It is an extremely simple matter to divide parapets and retaining walls into sections by introducing joints at the posts or pilasters. If such are made effective by the use of some material which prevents the adhesion of the two surfaces and gives a slight cushion, no difficulty will be experienced.

Terraces, etc. Similarly, the floors of exposed terraces must be given a chance to expand and contract. Sidewalks supported upon soil are generally cut through on 4- to 6-foot centers, which is satisfactory under normal conditions without any joint filler. The surfacing of exposed terraces, however, often requires carefully designed jointing to provide for temperature variations. Specifications normally call for a membrane seal beneath the tile or concrete wearing surfaces of loggias and exposed roof decks. Equal attention should be paid to the character of the mastic used to fill the expansion joints. Overflow due to expansion may be controlled by not filling the joints quite full, but there are few materials that will follow the receding masonry when the joint is broadened by contraction.

The method of obtaining a suitable grade over large areas of so-called "flat" roofs is another subject that deserves consideration. The simplest solution, and one often applied, is to lay the structural slab absolutely level and to obtain drainage by the use of cinder filling. This, however, increases the dead load, and where feasible it is better to pitch the roof slab itself. Of course there is no real objection to having an absolutely level roof surface, as the same guarantee can be obtained from the roofers, but if it is desirable to avoid pools of water remaining after rainy periods, a slight pitch is essential. It is usually practicable to work out a suitable grade in connection with the insulation of the roof, which becomes an important matter where conditions are likely to produce condensation. The steel roof deck, a type of covering which is extremely economical, and well adapted to certain types of buildings, presents a real problem in relation to insulation. Although furnishing a perfect base for the application of membrane roofing, ½ inch of fibrous insulation board is inadequate to prevent heavy condensation on the under side of the metal. It would seem desirable to provide thorough ventilation beneath all such installations.

NOTE. The author wishes to acknowledge his indebtedness to these firms and associations for the use of the photographs used as illustrations: American Steel & Wire Co.; United States Gypsum Co.; Truscon Steel Co.; Republic Fireproofing Co.; Barney-Ahlers Corporation; Jones & Laughlin Steel Corp.; Federal Cement Tile Co.; American Cement Tile Co.; Marc Eidlitz & Sons, Inc.

WALL STREET ENTERS THE BUILDING FIELD—II

BY

JOHN TAYLOR BOYD, JR.

THE preceding article, in THE FORUM for May, dealt with recent developments in construction finance, quite revolutionary in themselves and in their possible effect on the building industry. Introduced into the New York building world by several large corporations, with the strongest Wall Street financial support, they indicate a decided trend toward the efficiency of large scale operation. In this article there are discussed three specific financial plans illustrating the new methods. The plans are those of the Fred F. French Company, the Henry Mandel Associates, and the plan of the new triple combination of the Beaux-Arts Development Corporation,—a syndicate headed by a group of prominent architects with the huge U. S. Realty & Improvement Corporation, and the National City Bank, now the third largest bank in the world.

As explained in the former article, the principles of this method of financing, which is novel to the building industry but not outside it, are chiefly: (1) Investment value, as compared with the speculative element which characterizes too much conventional real estate finance. (2) Sale to the public of long term security issues at low rates for both junior and equity financing, involving the entrance of the public into ownership purchase of common stock of real estate.

These three financial plans are presented solely as illustrations of the new ideas of building finance. No attempt is made to select any one plan as the best. That is impossible, because the financial plan of a building varies in each case as does its architectural plan. Furthermore, any financial plan should be judged from these different viewpoints:

1. Of the construction corporation, seeking a steady supply of fresh capital at low rates.
2. Of the banking house whose aid is enlisted to market security issues directly to the huge public, composed of some 17,000,000 investors and speculators scattered all over the country. The securities sold must be sound and attractively priced in order to sell in competition with the flood of security issues of all types.
3. Of the individual investor, who selects his securities from among the myriad of offerings, according to his personal needs and preferences.
4. Of the building industry, to which the need is vital of obtaining for its expansion a constant flow of fresh capital at low rates.
5. Of the welfare of the American economic structure, which depends to a large extent upon the prosperity of the whole construction industry.

The financial plan of the Fred F. French Company is the first to be considered here. This is because this plan is well understood, having been in operation for a number of years and having been extensively advertised to the public. In the "French plan" the point of departure from conventional methods rests in its financing of that remainder of the cost of the completed building above the first mortgage of approximately 50 per cent by means of the sale of long term security issues directly to the public, using its own permanent sales force. In this way, the French Company obtains a never-ending stream of millions of dollars of new capital for its colossal building program, at presumably a much lower cost than it would if it used the ordinary methods of either mortgage bond issues or long term first and short term junior mortgages, both of which involve seeking equity from wealthy speculators.

In the French plan, the public takes on an actual ownership share in the individual building, with the opportunity of sharing in prospective profits in (1) increased land values, (2) increase in equity as mortgage is amortized, and (3) in prospective earnings and dividends. The investor's position is different from that of the purchaser of the conventional mortgage bond, who is a creditor and whose return is limited. The owner of stock in a French Company building depends for the soundness of his investment on these factors: (1) The success of the French Company's management, (2) the large proportion of equity, equal to approximately one-half of total cost, and (3) the economy and safety of the long term system of financing of junior and equity finance, under which both profits and repayment of junior financing are deferred for several years, until the earnings of the property are sufficient to carry the load. This advantage of long term financing was discussed in the earlier article. It was pointed out that it is (1) the terrific burden of heavy discounts, of premiums and high amortization rates on junior mortgages, and commissions of one sort or another,—often totaling 15 per cent or more,—and (2) the much higher cost of obtaining equity money, for which a big speculative profit must be shown "on paper," which break the back of many an intrinsically sound building enterprise. And, equally important to this financial load of short term issues, there may be charged the abandonment of many a good building enterprise, to the detriment of the construction industry.

The French plan bears two points of resemblance to the conventional method. One is its use of the conservative "institutional" first mortgage. In the ordinary French project the proportion of mortgage to total cost is, as already said, as near 50 per cent as practicable. The interest rate is usually 5 or 5½ per cent, and the mortgage is amortized. The second point of its resemblance to conventional methods is that the French plan does not directly give to the investing public the full benefit directly of diversified ownership in the chain of buildings, although the Company itself receives this protection of diversified risk. The typical French security issue is limited to a single building, which is incorporated as a separate company, with limited liabilities, as in the case of the usual mortgage bond issue which is not "guaranteed" by the house of issue. Thus the investor puts all his eggs into one basket. On the other hand, it should be pointed out that the investor may gain the protection of an investment in a chain of buildings by spreading his purchases over a number of French buildings. Incidentally, the investor has also the opportunity of buying the common stock of the "parent" Fred F. French Company, which is now traded in in the unlisted market in New York. This stock, which not so many years ago was "given away" as a bonus, recently sold at over $1,000 a share before its split-up. The French plan illustrates the great advantage of the long term method of junior financing. It would indicate that the customary division of financing into the long term first mortgage on the one hand and on the other the short term remainder of cost, is arbitrary, and has been carried to an illogical extreme. It runs up building costs and, in addition, it brings in its train a list of evils of excessive speculation.

The technical details of the French plan are interesting. The public buys preferred stock (6 per cent cumulative preferred, $100 par value) to the amount of about half the total cost of the operation, and with each share of this preferred stock the investor receives without further cost to him one share of common stock. For each share of common stock thus issued to the public, the Fred F. French Company receives one share of common as its profit. The result is that the investing public shares fifty-fifty with the French Company in the common stock ownership of the building, thus entitling it to half the profits. Profits accrue through retirement of the preferred stock, which is expected at the end of ten years in the average case. The retirement of the preferred is accomplished in ten equal payments of 10 per cent each, as the earnings permit, and no dividends can be paid on the common until all the preferred is paid off.

The Fred F. French Company performs all the operations that are necessary to produce a completed building,—buying the site, designing and constructing the building, selling the securities. In addition it operates the completed property through the Fred F. French Management Company. "Total cost" is the cost of land, construction, of carrying charges during construction, cost of selling securities, and of the normal fees paid to the Fred F. French Company for architecture, contracting, underwriting, for managing the building, and for the necessary advertising. I am informed that the usual underwriting fee is 5 per cent of the total cost of a French operation. This expense, be it noted, offsets somewhat the usual mortgage bond discount or charges for junior financing, but here again, in the French plan, the cost is spread over a period of years. The charge is not deducted at the beginning but instead is capitalized, and its payment is deferred.

When one has mastered the main points of the French plan, it is easy to understand the plan of the Henry Mandel Associates, which seems to be modeled along similar lines. The chief difference is that the Mandel plan gives the investing public the benefit of diversification through part ownership in a chain of properties, in addition to taking an interest in an individual structure. More specifically, the investor purchases "units" of stock at $110 per unit. The unit consists of one "investor's" share of $10 in the Henry Mandel Associates, the parent company, and one $100, 6 per cent convertible gold note in a single building. This gold note is convertible into 6 per cent cumulative preferred stock in the single building at the end of one year after completion of the structure, at the option of the holder, and, at the option of the company, in two years. The note matures in about ten years. Now, the investor's share of the common stock of the parent company, Henry Mandel Associates, is matched, share for share, and is paid for, dollar for dollar, by a "founder's" share, owned by Henry Mandel. In other words, Mr. Mandel invests in the common stock of the parent company owning the chain of properties, on the same basis as the public and to the same extent. Also, since the investors in the first buildings of the chain take a greater risk than those who invest in the later projects, when the success of this new enterprise has been presumably proved, these original investors will probably buy their common stock in the company owning the chain on a more favorable basis. In other words, the price of the investor's,—and of the founder's,—shares will doubtless be increased with each successive operation.

Other differences between the French and Mandel plans are (a) that the mortgage proportion of cost is about two-thirds in the Mandel plan, and (b) that the Henry Mandel Associates makes public semi-annual financial statements of its own condition and of that of each of its buildings.

It should be pointed out that there is a theoretical limit to the expansion of the Mandel chain of buildings. That lies in the proviso that Henry Mandel himself invests dollar for dollar with the public in the parent company. Today there is no man in the world, nor any group of men, wealthy enough to go on indefinitely matching dollar for dollar with the American investing public. This is an era of mass-investment as well as of mass-production and mass-marketing. Everyone in Wall Street appreciates this fact but, curiously, the building industry has scarcely yet grasped it.

But to this point, this complicated discussion of building finance has failed to answer the real question at issue. That is the simple, homely question which the prospective investor asks the stock salesman: "How much, exactly, can I expect to get out of it?" That question is the crux of the situation for everyone concerned. To throw light on it, I quote from the pamphlet issued by the Henry Mandel Associates,—"Our Plan,—Your Opportunity." On page 26 is the table which gives the expected operation of the retirement of the preferred stock:

End of Year	Net Profits Per Share	Dividend Received	Preferred Stock Repaid	Preferred Stock Outstanding	Principal Reserve
1st	$14	$6.00	....	$100	$8.00
2nd	14	6.00	$6	94	10.00
3rd	14	5.74	10	84	8.26
4th	14	5.04	10	74	7.22
5th	14	4.44	10	64	6.78
6th	14	3.84	12	52	4.94
7th	14	3.12	12	40	3.82
8th	14	2.40	13	27	2.42
9th	14	1.62	13	14	1.80
10th	14	.84	14	....	.96

Then, on the next page, it is said that after the preferred stock is retired, Henry Mandel Associates "will receive $14 per share per year for each share of common stock of the building. If it is assumed that a stock earning $6 per share is worth $100, then this income of $14 per share gives the common stock of the building a value of $233 a share." This is the stock for which the investors in the first building paid $10 ten years before, and received, meanwhile, no return on it, which adds to its cost at the end of ten years at say 6 per cent compound interest.

In Part IV of the same pamphlet, entitled "How Investors' Common Gains Value" is said: "Our experience has been that such buildings have a valuation on completion of upwards of 20 per cent above the cost of land and buildings, and that this increases after completion. Buildings are commonly sold at completion at profits of from 15 per cent to 50 per cent above cost." On "the conservative assumption that the property gains 20 per cent in value at completion, the common stock of the building gains (in the typical case illustrated) immediately a value of $50." This value "rises as the 6 per cent cumulative preferred stock is retired, with the result that, at the end of the retirement period, this common stock value per share will include the $100 which was the original cost of the preferred stock investment." Then it is said that "land in the areas (of Manhattan Island) where the Henry Mandel organization operates has a natural increase in value ranging from 3 per cent to 10 per cent annually. Assuming the lower figure, this increased land value represents a gain of $225 a year for each share of common stock of the building."

Office Building, New York, Financed on the Mandel Plan

Farrar & Watmough, Architects

The effect of these assumptions of increased value of the common stock is summarized in this table, copied from the pamphlet:

Source of value	Number of Years after Completion of Building 1	5	10	15
(1) Gain in value of building at completion....	$50.00	$50.00	$50.00	$50.00
(2) Natural increase in land value..........	4.50	13.50	24.75	36.00
(3) Retirement of preferred stock equity	....	36.00	100.00	100.00
Total	$54.50	$99.50	$174.75	$186.00

These figures are, of course, estimates. No one can actually tell just what the exact financial position of the building will be in future years in respect to rentals, nor can one know exactly when obsolescence will set in, affecting the "economic life" of the property and its value. On the other hand, I believe that these mathematical computations of the *possibilities* of common stock ownership in real estate are well worth publishing, because they throw a new, clear light on the possible advantages of equity ownership in good real estate. That is an essential factor in real estate finance in these days when the investing public is seeking common stock ownership in basic American industries.

The plan of the Beaux-Arts Development Corporation-U. S. Realty & Improvement Company-National City Bank triangular combination, as illustrated in their first enterprise,—the $5,200,000 Beaux-Arts Apartments, Inc., located on East 44th Street, New York,—is more complex and is even more radical than the other two. The magnitude of the program contemplated, and the elimination of mortgages astonished New York, accustomed as it is to bold finance. This plan is not easy to describe. Kenneth M. Murchison, President of the Beaux-Arts Development Corporation,—the real estate promotion company composed chiefly of architects, discussed the plan frankly with me one morning.

The complication in the Beaux-Arts Apartments plan of finance centers in the involved interrelations of the three affiliated companies sponsoring the project. Between them, they perform about the same function as do the single French and Mandel organizations, in producing and operating a chain of buildings and selling securities to the public in the process, making investors part owners in the properties. Therefore, the picture clears if we imagine the triple combination taking the place of the French organization, and issuing securities, in the form of preferred and common shares, limited to a single building which is separately incorporated. That makes clearer the position of the investing public in the enterprise, and that, after all, is the point of this whole business. It is shown in this comparison, in which, in the Beaux-Arts plan, the three sponsoring companies are lumped together as "the Companies":

Division of Ownership in the Beaux-Arts Apartment Finances

	Total First Cost of Operation	Ownership of Common Stock (Profits)
Investing Public	75% consisting of 1st 6% preferred stock	40%
"Companies"	25% consisting of 2nd 6% preferred stock	60%

Division of Interests in the Fred F. French Plan

	Total First Cost of Operation	Ownership of Common
Mortgage Company	50% mortgage	0
Investing Public	50%—6% pf. stock	50%
French Company	0	50%

As compared with the conventional method, it is also apparent that, in the Beaux-Arts plan, the first preferred, bought by the public, takes the place of the usual two or three mortgages, and that the second preferred, contributed by the "Companies," takes the place of the usual equity. This arrangement puts the public in a very strong investment position. The investor cannot be "wiped out" by foreclosure. In fact, equally important, the consistent application of the principle of deferred profits protects that small proportion of junior mortgage risk which lies in his first preferred shares. Thus the soundness of the first preferred may be described by saying that about 85 per cent of it replaces a first mortgage (corresponding to the conservative 66 2/3 per cent first mortgage). The remaining 15 per cent contains a junior mortgage risk, or on the basis of a 60 per cent first mortgage, it represents an 80 per cent-20 per cent division.

The position of the public in the Beaux-Arts plan is completely explained when we understand the details of the retirement of the two series of preferred stock, and the possibilities of profit on their 40 per cent ownership in the common stock.

The first preferred is 6 per cent cumulative, retirable in whole or in part, at the "Companies'" option, at a price of $102.50 per share. It is sold with the common in "units" of one share of first preferred and one share of common, at $100 a unit. It is expected that one-third of the first preferred will be retirable in ten years (Mr. Murchison thinks it will be six), leaving the remainder outstanding to the amount of 50 per cent of total cost of the property. The second preferred, representing approximately another 25 per cent of cost, should be retired completely about three years later. At the end of this period, the common stock, which originally represented nothing but hopes of future profit, may have an equity behind it of about one-half the original cost. In addition, the full benefit of any appreciation in the property accrues to the common shares. Earnings on this common are expected to be $3 a share at the end of ten or a dozen years; if earnings permit, dividends may be paid on it before all the preferred is retired.

Comparing this $3 per share return on the Beaux-Arts Common with the $14 expected return on the Mandel common (which costs $10 a share), we see a large difference. The difference may be partly explained by the fact that the

Beaux-Arts Apartments, New York
Firm of Kenneth M. Murchison, and Raymond Hood, Godley & Fouilhoux, Architects

Mandel preferred shares represent a 33 1/3 per cent equity risk above the mortgage, whereas the Beaux-Arts first preferred is more nearly equivalent to a first mortgage risk. One might therefore conclude that the Beaux-Arts plan is designed to attract a more conservative class of investors.

It remains to describe the operation of the Beaux-Arts plan within the three companies and their subsidiaries. "The Companies," we have seen, provide the 25 per cent equity cost of the project in the form of second preferred, and take 60 per cent of the common shares as deferred profits. On the Beaux-Arts Development Corporation there falls the burden of taking the entire issue of second preferred stock. What actually happens is that the Development Corporation buys the site for the building and contributes it, at a fair value, to the enterprise, receiving in payment the second preferred shares. This is, of course, a form of the familiar subordination principle. The individual architect among the stockholders who has worked up the project receives the architectural commission on a basis of office cost plus fee, the fee being taken in stock. The next point is that the Development Corporation, having provided most of the equity, obtains most of the common stock profits, specifically approximately 40 per cent, or the same share as the public. That is, three shares of common go with one share of second preferred. That leaves 20 per cent of the common still to be accounted for. This is split half and half between the U. S. Realty & Improvement Corporation and the National City Bank. Actually, this 20 per cent of common goes into the treasury of the U. S. Realty Management Corporation, which is a subsidiary formed to own and operate the chain of properties that it is proposed to establish. This U. S. Management Corporation is owned equally by U. S. Realty and the bank, through the latter's securities subsidiary, the National City Company. When we have said that both the National City and U. S. Realty have an interest in the Beaux-Arts Development Corporation, we have completed the description of the chain of relationships in the three affiliated companies.

The responsibility of the U. S. Realty in the organization is two-fold. First, it constructs the building through its subsidiary, the George A. Fuller Company, on a cost-plus fee contract. Second, it shares with the National City in financing and underwriting the project. The function of the National City is to share with U. S. Realty in underwriting and to sell the securities to the public through its vast chain of branches, representatives and agents, assisted by its powerful affiliated group of Wall Street investment houses. The underwriting was done at cost, the charge therefor being 5 per cent, plus 20 per cent of common profits as noted, thus deferring the financier's profits. This compares with an 11 per cent charge on a mortgage bond issue, which, however, is deducted at the start. This issue of units of first preferred and common, to the amount of $3,937,500, was sold to the public, so we are told, in one day.

One point more. The Beaux-Arts Development Corporation really represents the land interest, which, as everyone knows, is the crux of the situation in many a real estate project. Recognizing this fact, we have this division:

Division of Interests in the Beaux-Arts Apartments

	Investing Public	Land Owner (Beaux-Arts Develop. Corp.)	Construction & Finance (U. S. Realty & Nat'l City)
1st pref. stock	75% of total cost and 100% of issue	0	0
2nd pref. stock	0	25% of total cost or equity 100% of issue	0
Common stock	40% of issue	40% of issue	20% of issue

Thus, from the point of view of the construction industry, the Beaux-Arts plan may be summarized in very simple terms. The owner of a valuable plot of land goes to the officers of the U. S. Realty & Improvement Company and persuades them that they could do no better than to construct and finance a building on that particular plot. The land owner contributes the site, at a fair value, as the 25 per cent equity in the deal, and takes the 6 per cent second preferred in payment, plus a 40 per cent share in the future common stock profits. U. S. Realty agrees to finance the remainder of the cost, namely 75 per cent, which it does by joining with the National City Bank in underwriting the sale to the public of the first preferred shares. U. S. Realty also constructs the building. The profit to U. S. Realty and to the National City interests is 20 per cent of the common shares, each receiving 10 per cent. This common goes to the U. S. Realty Management Company in which both U. S. Realty and the Bank have an equal interest. Practically everybody, public included, contributes money, land and services at cost and defers his profits for several years.

Clearly, this method of long term financing, with deferred profits and public participation in the ownership of a building, is revolutionary in its efficiency. It raises real estate finance to a more stable investment basis. Still more important, it requires, to no small extent, that the adoption of the chain principle be considered in order to induce all interests concerned to accept deferred profits. With a chain of successful properties, people are willing to undergo a few lean years if they know that they are investing in a sound, continuing enterprise, by a method which steadily increases their equity, causing appreciation of the common stock and which, at the end of the waiting period, begins to flower with expanding profits. More accurately described, "deferred profits" really means postponing the taking of profits. In a successful real estate enterprise of the type here considered, the profits theoretically increase from the start, but are not taken out immediately. Particularly, they are not taken out in advance, as is sometimes done in "shoe string" operations. They may, however, be "anticipated" through the appreciation of the common stock before it pays dividends.

In conclusion, it should be said that the architect's position in the new development is important. Architects have every reason to approve efficiency and sound investment value in buildings. Particularly will they approve of the initiative of the group of architects who form the majority of the owners of the Beaux-Arts Development Corporation. These men seem to have applied the new ideas on a broad and consistent scale. They have shown, I think, the possibilities of the leadership of architects in improving the methods of building finance.

THE SUPERVISION OF CONSTRUCTION OPERATIONS

BY

WILFRED W. BEACH

CHAPTER 7, FOUNDATIONS AND MASONRY MATERIALS

IN these dissertations on the general subject of construction supervision, we are seeking to discuss the problems confronting a superintendent somewhat in the order that they are presented to him during the progress of the work. He arrives at the site about the time the building is being staked out and the excavating is beginning. Shortly thereafter, materials start to arrive,—form lumber, cement, concrete aggregates, reinforcing rods, brick and other masonry materials. The superintendent has, perforce, to inspect these and to watch the excavating at the same time. Ordinarily, the latter duty is not onerous, as soil conditions in small areas are generally uniform. It is only when they lack such uniformity that supervisory duties at this preliminary stage become at all pressing.

Two features somewhat out of the ordinary are introduced in connection with the schoolhouse work here described, to show that the need for the exercise of diplomacy and acumen may exist at the initiation of proceedings, perhaps in as great a degree as at any other stage of the work. One such feature is a presumption of irregular soil conditions, demanding a local test; and the other is the supposition of an improper personal interest in certain phases of the operations by members of the board of education. Such an undue interest may sometimes develop into one of the most embarrassing phases of the work. Its ramifications may be extensive and most ominous, without being readily discernible or easily traced. Pressure may be brought to bear from unexpected sources to influence leniency in the judgment of certain materials or even in the retention of incompetent employes and subcontractors. In such an event, the architect has but one course to pursue, and that is to act in accordance with his best judgment for the good of the building, regardless of consequences.

After the board meeting on Tuesday afternoon, the architect and superintendent were taken to the gravel pit by the contractor. The storm of the preceding day had done considerable damage by washing the top soil down into the pit and mixing it with the sand and gravel. At first sight, it appeared useless to attempt to extract any more usable material from the place, but the contractor was determined and promised to put in a power pump and washing plant, if needed. With this understanding, deliveries were permitted to continue, though the architect had heard severe criticism of the gravel in board meetings, originating, presumably, with parties having crushed rock to sell. But both sand and gravel were of such excellent quality that it would have been unjust to forbid their use, if the silt could be kept out or removed.

Returning to the building site, they found two large trucks unloading the first deliveries of common brick. These were not being dumped but were being handled like face brick. This fact alone was enough to arouse suspicion, and hence an immediate inspection was made, revealing a much too great percentage of soft brick.* Evidently the yard was not sending out the "selects" approved by the superintendent. The architect would have rejected the whole delivery without further ado, but the superintendent called his attention to the interest of a board member in the transaction and proposed having them culled at the expense of the manufacturer to bring them up to grade. The contractor telephoned the yard but could get no satisfactory assurance at that end. He turned to the architect. "I suppose you know," he said, "that this lumber dealer on the board has a one-third interest in that brick yard, but do you fully realize what we are up against on this job? So far as I have been able to find, the chairman is the only one on the board who hasn't an axe to grind. Except for him, everyone, including the husband of the woman member, is trying in some way, open or underhanded, to make something out of this schoolhouse. So you men are not only superintending me but the owner's representatives as well; a nice situation. Now, I'm supposed to be saving a dollar a thousand by buying these bricks instead of shipping in good stuff but, if you say these are rejected, back they go, and I'll shoot in some from my regular supply which I know will be O. K." Before a reply could be made, the lumber dealer drove up, saying he had been advised by the yard that there had been a mistake in the hauling, that the brick had been loaded from the wrong pile. This the contractor knew to be a fabrication, but they listened to the dealer's further assurance that he would have these culled and that there would be no further complaint about the quality. There they allowed the matter to rest for the time being.

The steam shovel and trucks were working in the excavation, but they could not function to advantage in the lower portion on account of the mud. Some of the trucks were being used for hauling cinders to improve the temporary driveways. The architect was much concerned about the character of soil that would be encountered at the level of the bottom of the footings. The excavating had thus far disclosed nothing but sandy loam (below the black top soil), with a small percentage of clay. Borings and other excavations in the vicinity indicated this to be the general character of the terrain for a depth of from 3 to 5 feet, at which level the increasing ratio of clay and gravel tended rapidly to replace the loam, thus providing a bearing stratum, several feet in depth, which the architect deemed capable of sustaining a superimposed loading in excess of 4,000 pounds per square foot. There had been small doubt of reaching such a stratum, as the footings were originally designed, but, having raised them 3 feet, the situation was no longer one of certainty.* It was therefore decided by the architect that as soon as excavating had reached bottom (a plane 9 feet below finished basement floor), the superintendent would have two tests made by the contractor at points to be selected. This procedure was covered by two specification provisions. Under the general subject of "Testing Materials" was found:

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* Specification for common brick: "All common brick shall be square-edged, sound, hard-burned, firm in texture, fairly uniform in size, shape and color, and free from lime lumps, cracks or other serious defects. No soft or salmon colored or other unduly absorbent bricks accepted. All shall be first-hand, 98 per cent whole."

"TESTS shall be made by the Contractor of his workmanship and materials and of the operation of mechanical equipment as required by law and the Contract Documents, all in manner directed by the Architect or approved by him. All expenses in connection with such tests, including the use of materials, labor, power, light, heat and equipment, shall be borne by the Contractor, unless otherwise stated.

"ADDITIONAL TESTS, not called for by the specifications, shall be provided by the Contractor under direction of the Architect, at the expense of the Owner, except that, in cases where such tests give evidence of defective materials or workmanship for which the Contractor may be required to make allowance or replacement, then the cost of such tests shall be borne by the Contractor. The expense will be audited by the Architect who, if same is to be charged against the Owner, will have an extra order issued for the amount as elsewhere provided, which amount will include 10 per cent to cover Contractor's overhead and profit.

"NOTICE OF TESTS shall be given to the Architect or his Superintendent by the Contractor in due time to permit advising all those interested. No tests will be deemed valid unless duly witnessed by the Architect or his Representative.

"RECORDS of all tests, neatly typed on 8½" x 11" sheets, accompanied by necessary diagrams, charts or photographs to thoroughly explain same, all in duplicate and duly certified and signed, shall be prepared by the Contractor as part of the expense of the tests, and deposited with the Architect."

And, under "Trench Excavating" in "Foundation Work":

"INSPECTION AND SOIL TESTS. Bottoms of all trenches and pits shall be left level, free from rubbish and reasonably smooth. No concrete for footings may be poured until the Superintendent has had opportunity to examine surfaces to be covered. He may then order the surfaces to be placed in better condition or may order a test of the bearing capacity of the soil made by the Contractor at the Owner's expense, after which the bottom of the trench or pit shall again be prepared at directed depth and re-submitted for inspection."

After the architect left, the superintendent strolled over to the brick yard to confirm his suspicion that there had been no mistake in the delivery of the wrong brick. Being after hours, no one was about the premises. He could see beyond question that there had been no activity around the pile of "selects" since he had first inspected it. A large new pile, from which deliveries to the school had evidently been begun, was of the same character of brick as those already unloaded at the site. It was obvious that, if the latter had to be reculled, the same would be true of this entire pile, containing over 50,000 brick. No doubt remained in the mind of the superintendent as to the intent of the brick makers. The pile of "selects" had been made up for exhibition purposes only, with no intent to deliver therefrom. He could visualize the trouble ahead if the manufacturers continued deliveries, relying upon the "pull" of their partner on the board to prevent rejection. He was early on the job next morning and stopped the first brick truck, loaded as he anticipated, and notified the contractor not to permit the brick to be taken off. The driver telephoned his office, and shortly there again appeared the ubiquitous lumber dealer who now contended that it had been arranged with the architect on the preceding day that the brick should be culled at the job. The superintendent pointed out that this applied only to what was already unloaded and said with finality that no more improper material would be permitted to be brought to the premises. The dealer tried to reopen the subject from the beginning by arguing that the brick were being discriminated against; that, inasmuch as none were destined to be exposed to the weather, better brick than those offered were not needed. To this the superintendent rejoined that it was his business to see that all material entering into the construction was up to the standard* that the owner was paying for. The dealer was so palpably inclined to make an issue of the matter that the superintendent telephoned to the chairman of the board and asked him to come over and be present at the discussion. His appearance was somewhat disconcerting to his fellow board member, who was asked to re-state his case. Then, before anything else could be said, the chairman drew him aside and, after a brief colloquy, the latter spoke to the truck driver and the two drove away, much to the surprise of both contractor and superintendent. The chairman explained that he had anticipated some such *impasse* from the beginning and had foreseen the advisability of the dealer's resigning from the board on account of his extensive interest in selling construction materials. This he had just consented to do, and hence would deliver no more brick until after his official connection had been formally severed. The contractor thereupon said that he would cancel the order for the remainder of the brick, and he agreed to see that those already on the ground were properly sorted before any were used.

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* See Chapter 1, pages 30 to 34 of T. M. Clark's "Building Superintendence," The Macmillan Company, 1895. There is much of value to the young superintendent in this volume, but one must bear in mind that building conditions and methods are constantly undergoing changes, and hence certain items treated by Mr. Clark, such as the discussion on concrete here referred to, are obsolete.

Unfortunately, architects and engineers (and even some specification men) are not of one accord in their attitude toward common brick quality. For this there are probably several reasons. One is that engineers like to provide tests for structural materials,—and ordinary common brick will not stand severe tests. "Good bricks should be quite hard and burned so thoroughly that there is incipient vitrification all through the bricks. A sound, well burned brick will give out a ringing sound when struck with another brick or with a trowel. A dull sound indicates a soft or shaky brick. This is a simple and generally a sufficient test for common bricks, as bricks with a good ring are generally sufficiently strong and durable for any ordinary work," according to F. E. Kidder in "Building Construction and Superintendence." "Very soft, underburned bricks will absorb from 25 to 35 per cent of their weight in water. Weak, light red brick, such as are frequently used in filling in the interiors of walls, will absorb from 20 to 25 per cent, while the best bricks will absorb only 4 or 5 per cent. A brick may be called 'good' which will absorb not more than 10 per cent," according to Baker in "Masonry Construction."

One frequently finds an architect's specification which carefully discriminates between the different grades of hollow clay tile, classified according to their function in building, but making no such distinction between the various purposes of the common brick. In general, three distinctive grades of hollow tile are recognized: well burned "'load-bearing," capable of withstanding prescribed crushing loads; well burned "non-load-bearing," suitable for any walls subjected to limited light loadings; and soft porous tile for partitions, needing only sufficient density to withstand rough handling. The same classification could be used for common brick, if intended for the same usages. But, as few common bricks are used for non-bearing partitions, the soft grade is "taboo" and, since any good common brick is to be considered "load-bearing," the one grade, which may be termed "good," is the only grade permitted under the majority of architectural specifications. However, in some communities, the ordinary run of local brick in common use is not up to such standard of "goodness," and the "outside" architect is confronted with the problem that we have been discussing. Investigation will likely disclose the fact that the better class local architects in the vicinity where such brick are the only brick made, are accustomed to call for two grades of common brick, thus:

"COMMON BRICK shall be firm and compact, well and evenly burned, of a good grade of clay or shale, free from lime lumps, of fairly uniform size, shape and color, free from cracks or other serious defects and 90 per cent whole. They shall not have over 20 per cent absorbency. They may be used for all brick masonry, except where select common brick or face brick are called for.

"SELECT COMMON BRICK shall be equal in all respects to the foregoing specification for common brick, except that they shall be hard burned, 98 per cent whole, and shall not have to exceed 10 per cent (or 5 per cent) absorbency. They shall be used whenever called for, also for all piers laid in cement mortar and for the facing of all outside walls, except where face brick or other material is called for."

Probably such "selects" are shipped in, in those instances. A too exacting common brick specification is unwise, since unnecessary hardness means undue vitrification, which makes the brick difficult to lay, slippery when wet or cold, and not readily adherent to any but pure cement mortar. In the work being used here as an illustration, the walls above the basement were chiefly of load-bearing hollow tile, with facing of pressed brick, common brick being used only for certain piers and walls of heavy loading, and for certain basement partitions. The brick were correctly specified, and the specification properly interpreted.

The brick subject being disposed of for the time being, the contractor and superintendent next gave attention to conditions relating to the excavating. The general excavating (subcontract) extended to 6 inches below the tops of the footings (see Fig. 10), but the additional hand

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* See Chapter VII of Part I of "Building Construction and Superintendence," by F. E. Kidder (William T. Comstock Company, 1923), for an excellent dissertation on the manufacture and characteristics of the different kinds of brick.

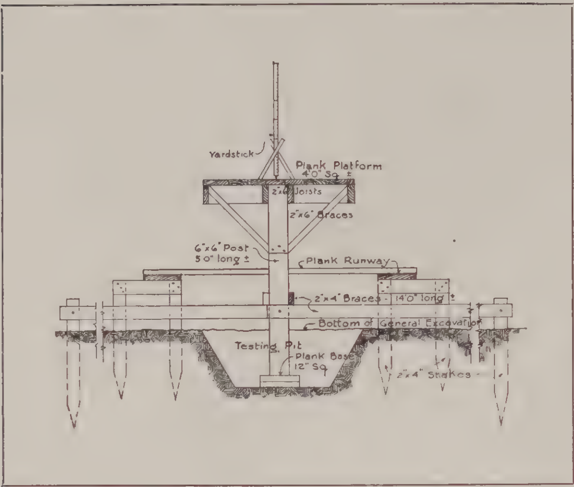

Fig. 9. Platform for Testing Bearing Capacity of Soil

work of trenches and pits was included under "Concreting" for obvious reasons. Specifications for this work read:

"GENERAL EXCAVATING is assumed to extend to sufficient depth (9 inches below upper planes of various basement floors) to permit material from trenches and pits to be distributed and compacted under cinder floor fill. This Contractor shall provide additional cinders or sand, if any is needed, to bring areas up to proper planes to receive the floor material as specified, or shall remove any surplus.

"ALL PITS AND TRENCHES shall be excavated to neat size required, if banks are sufficiently firm to be used as forms for concrete. If not, the form work required for upper portions of footings and pit walls shall be extended to bottoms of same, and the excavating shall be increased to accommodate same, without additional cost to the Owner."

Then followed the paragraph on "Inspection and Soil Tests" previously quoted. This was supplemented by a paragraph under "Concrete Footings":

"INCREASED DEPTH OR WIDTH OF FOOTINGS shall be provided by the Contractor when so ordered by the Architect, for which the Contractor will be allowed an extra price of fifty cents (50 cents) per cubic foot of concrete thereby made necessary, which price shall include also the cost of required additional excavating, back fill, overhead cost and profit. If additional form work is required in such case, it shall also be provided and will be paid for at the rate of five cents (5 cents) per superficial foot. Additional reinforcement shall also be provided, if required, and will be paid for at the rate of four cents (4 cents) per pound. All such extra payments will be made in accordance with provisions in General Conditions covering same."

A formal order was received from the architect's office next morning, covering the labor and material necessary for two soil tests, and the superintendent delivered copies to the contractor and the secretary of the board, directing the former to proceed with the work on authority of the architect's signature, without waiting for formal board action. This "Change Order No. 3" was in form similar to those preceding, but the clause covering remuneration read: "for which material and labor, you will be reimbursed by the Owner to the extent of the net cost of same, plus 10 per cent; subject to the audit and approval of the Architect's superintendent, which gross sum will be added to your contract price."

Bottom was reached that morning along the south end of the east wing, and a shallow pit was dug out and leveled at the grade at which footings were supposed to rest. For testing purposes, a platform was constructed as shown in Fig. 9. This was supported and rigidly braced atop a post, the bottom of which was exactly 144 square inches in area. This contrivance was erected in the pit, extreme care being taken that the base should rest on original soil, perfectly level, since any tipping would cause compression on one side or corner and render the test worthless. While held rigidly in this position, the post was anchored in each of four directions, by means of a "two-by-four," 14 feet long, placed horizontally (so as to offer no resistance to the settlement of the post), and each outer end was attached by means of a heavy spike to a stake driven firmly into the ground, the other end similarly spiked to the post. Another spike was driven at the center of the platform, and a yardstick was erected on the head and braced in position. A reading was taken on the yardstick by means of a surveyor's level, and referred to a permanent bench mark. The object of resting the end of the yardstick on the nail head is to have a definite spot to which reference can be had in case the yardstick is displaced.

Sacks of cement were used for loading, placed two at a time on opposite sides, with much precision, to avoid disturbing the set-up; next, two were placed on the other two sides and one on each of the four corners, eight in all, making a superimposed load of 800 pounds. A second reading then taken showed a settlement of ⅛ inch. Another 800 pounds was then deposited, but the reading on that showed no further appreciable settlement, nor was more noted until the fifth such loading, when the platform went down 5/16 inch more. The test was thereupon stopped and the loading left to stand over night, with a watchman to guard it. In the morning it was found to have gone down ⅜ inch more, a total settlement of 13/16 inch, which the superintendent deemed excessive. He might recommend increasing the spread of the footings at this end (which was the lowest part of the basement, containing the boiler room) or carrying them down to a firmer stratum, if within reasonable depth. It appeared that they were in exceptionally poor soil, immediately at the head of a small ravine, and that it might be better to increase the depth throughout a limited area, rather than to make a re-study of the footings and their reinforcement, so he ordered another hole prepared, 3 feet deeper, and repeated the test. It was a new proceeding in the locality and attracted a considerable "gallery," and proved to be the cause of much comment. As a result, the laborers were distracted and less careful with the next test, and therefore made a failure of the set-up. The third was unevenly loaded and likewise failed. The next was given due care and succeeded, both as a test and in demonstrating the bearing capacity of the stratum reached. The first load reading showed 3/16 inch settlement, and the next (with 1,600 pounds on) an additional 1/16 inch. Thereafter, no appreciable difference was detected, even with 4,000 pounds on the platform. The superintendent then ordered another 800 pounds added, which went down another 1/16 inch. Next morning, the loading was found to be stabilized at a total settlement of 5/16 inch, which was deemed quite satisfactory, in view of the fact that the first ¼ inch was an initial settlement.

Particular note was taken of the characteristics of this substantial bearing stratum, and the trenches were carried down to it at the southwest corner and stepped up from it (as the stratum tilted) until normal height was reached, all in accordance with telephonic instructions from the architect. He arrived on the scene before the final testing set-up was dismantled, inspected the reports of the tests, and estimated the sum due the contractor for the additional concrete, excavating and back fill, as provided in the specifications. Change Order No. 4 was written accordingly, covering 840 cubic feet of concrete, etc., at 50 cents a foot, a total of $420 extra for the item. To this was added the sum of $115 for the cost of conducting the tests, as provided in Change Order No. 3.

The ground had sufficiently dried out after the rain for observation as to the amount of moisture the soil would normally carry. The architect decided to adhere to the provisions for waterproofing included in the contract, which will be treated of in another chapter. He had been uncertain as to whether or not membrane waterproofing was indicated for the boiler room floor and lower walls, as specified for the swimming pool. His judgment was that the tile drainage around the walls would be sufficient to keep this section dry, even at the depth of the ash pits under the boilers, in this case the lowest point.

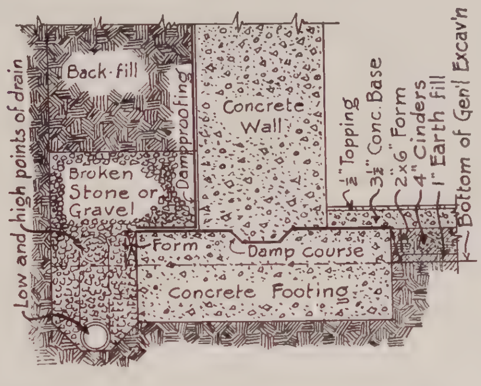

Fig. 10. Section Through Footing

Careful observance of all soil conditions is of first importance in building construction, especially when the architect is working in unfamiliar territory. The Chicago building ordinance gives these restrictions as to maximum loads permitted:

	Lbs. per sq. ft.
On pure clay, at least 15′0″ thick	3,500
On pure clay, dry and compressed	4,500
On pure firm sand, at least 15′0″ thick	5,000
On a mixture of clay and sand	3,000

That these allowable loadings are "safe" to the extent of being extremely light is proved by experience and evidenced by competent authorities. Those given in Kidder's "Architects' and Builders' Pocket Book" are about twice as heavy. In point of fact, it is difficult to lay down any fixed tabulated figures assumed to apply to different soil compositions, though several writers quote what they consider a "summary of good practice."* It will be seen that these weights in tons per square foot from the New York building code, 1916, are much greater than the loadings used in Chicago:

	Tons
Wet clay	1
Wet sand or firm clay	2
Sand and clay, mixed or in layers	2
Fine and dry sand	3
Dry hard clay or coarse sand	4
Gravel	6
Soft rock	8
Hardpan	10
Medium rock	15
Hard rock	40

The two important factors relating to foundation bearings are that a certain safe loading shall be arrived at and that the various footings shall have been so designed that the loads shall be fully equalized for all foundations, guaranteeing equal settlements (if any) throughout the entire building area. If one uses a reasonable factor of safety in his footing load computations and these are free from error, one need have no fear of settlement cracks appearing, providing that the supporting stratum is uniform in character and that there is no undue variation in the subsequent live loading. It is therefore the superintendent's duty to closely observe the character of the stratum on which the footings are deposited and report for consideration any lack of uniformity. A location similar to that we have presupposed for discussion may disclose such a dip in the harder subsoil as to demand considerable spread of footings or even the driving of piles.*

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* See "Foundations by Albert M. Wolf" in Hool & Kinne's "Reinforced Concrete and Masonry Construction"; also "Foundations on Land" in Merriman's "American Civil Engineer's Handbook."

Much of the requisite ability to judge soil-bearing capacity by inspection is solely a matter of experience. The superintendent must train himself to expertness in this particular. For soils manifestly too soft to attempt a spread footing (with carrying capacity under 2,000 pounds per square foot) or where the stratum overlying such soft material is too thin, recourse must be had to some means for compressing such soil, or for carrying the foundations down to bedrock or suitable hardpan. The design and supervision of pile, caisson and concrete-filled well foundations is a branch of engineering demanding diligent study by any superintendent confronted with such needs.**

On straightaway concrete footing work, which constitutes an overwhelming percentage of all present-day foundations in this country, a superintendent has little to worry him, other than watching the concrete and checking dimensions, neither of which is, however, to be slighted in the smallest degree. Contractors have been known to make their trenches an inch or more scant in depth or width, or both. A saving of 1 inch in the depth of all footings of this school building would have totaled about 270 cubic feet of concrete and 10 cubic yards of excavating; and of more importance is the fact that it would have cut down the efficiency of the concrete from 6 to 8 per cent.

It is customary, in soil of sufficient firmness, to cut square banks and use the natural earth for forms, rather than to line the trenches with wood. In either event, there are frequent droppings of earth into the trenches (or into the fresh concrete), and hence the excavated material must be kept well back and adequately shored. Some architects specify that the bottoms of trenches shall be tamped before concrete is poured. Others prefer to have the concrete deposited directly on the natural earth bed, without tamping, because the presence of a tamp in the trench offers a constant temptation to compress in place the loose material that should be removed, if specification requirements are to be complied with. In either event, the superintendent must carefully watch the bottoms and sides of the trenches just before and during pouring and see that all surfaces are in proper condition to be covered. He must also be a good judge of the water-bearing capacity of soil strata. Foundation work must frequently be carried on in wet weather, in which event it may be found advisable to proceed with soil tests under unfavorable conditions. Such tests have been made and trench bottoms leveled in mud and running water, with a pump constantly at work. Ideal conditions are not always at the command of the superintendent. He takes conditions as he finds them and does his best, his goal being the securing of proper results.*

When the bottom of the general excavation for the school building was reached in the east wing and the trenching (which, with the foundation work, was being handled by the contractor's own forces) was begun, the superintendent told the general foreman that shoring was specified. This was covered by a special provision under "General Excavating," in addition to the paragraph in the "Supplementary General Conditions" quoted in Chapter 4:

"SHORING. The Contractor shall provide and install all shoring, sheet piling and other bracing required to maintain the banks of all excavated areas until foundation work has been approved for back filling. The Contractor shall be wholly responsible for the retention of all banks, but his shoring or other false work will not be permitted to encroach upon space required for foundation construction or form work."

The superintendent and foreman agreed that this left the matter to the option of the contractor, who would obviously be the loser if damage resulted from lack of foresight in this particular;

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* A central heating plant chimney at the University of Illinois, Urbana (Temple & McLane, architects, 1897), has a foundation 20 feet square on the bank of the historic Boneyard Creek. In this small area, the variation in the bearing strata is so abrupt that the footing was divided diagonally in halves, one of which rests on firm soil and the other on a number of wood piles. At last account, the stack (150 feet high) was as erect and firm as when first put to use.

** For dissertations on heavy foundation work, the reader is referred to "Foundations, Abutments and Footings" by Hool & Kinne, "Pile Foundations" in "Reinforced Concrete and Masonry Structures" by the same authors, "Improvement of Bearing Capacity" in Merriman's "American Civil Engineer's Handbook," "Piling in Compressible Soils" in Volume 1 of "Architectural Construction" by Voss & Henry, "Foundations on Compressible Soil" in "Building Construction and Superintendency" by F. E. Kidder, or an exhaustive treatise on the subject of "Piles and Pile Driving" in Dr. J. A. L. Waddell's "Bridge Engineering."

* Part of the footings of a three-story, office and apartment building of fireproof construction in Mitchell, S. D., are on quicksand. This shifty material will stay in place so long as the pressure against it is equal in all directions. A soil test such as described proved that the sand would carry 3,000 pounds per square foot and the loads were distributed accordingly. Under similar conditions in Cairo, Ill., a locomotive was used to pump water from the basement of a freight house, with the result that sand in the unfloored space went with the water, a footing was undermined, and considerable settlement took place, causing a bad crack, before the pumping was stopped.

hence the foreman said he would report that the banks were apparently solid, and that shoring at that depth was not customary in that locality. The contractor could then act as his judgment dictated. Before shoring was ordered, another rain occurred, immediately after which the first truck load of shipped-in brick was dumped too close to the northeast corner of the excavation, causing a small landslide which caught a man in the trench and broke his leg. Thereupon, all banks more than 6 feet high were shored, and no further trouble resulted. It will be noted that the owner, architect, superintendent and foreman were free from blame in the matter, and that the responsibility had been placed where it belonged; but the man of most experience had guessed wrong. No one has ever become infallible in the "building game."

Excavations in rock, or in sand or gravel containing boulders, necessitate specification clauses covering such conditions. If they are definitely predetermined, the contract may be formulated accordingly; but it is common practice to cover uncertainties by demanding unit prices from bidders on excavated materials out of the ordinary, thus:

"ROCK EXCAVATION. It is assumed that the material excavated will be such as can ordinarily be handled by a steam shovel. If a boulder or boulders or solid rock be encountered of mass in excess of one cubic yard, necessitating blasting or breaking by other means, the Contractor will be allowed a unit price per cubic yard for same in addition to the amount of his contract.* Each bidder is requested to state in his bid the gross cost per cubic yard for such excavating in addition to that included in his contract for ordinary excavating."

It is then up to the superintendent to determine what excavated materials are affected by such a clause and to make due allowance for them, if allowances are indicated. Advance data as to soil conditions by borings or digging are informative but not conclusive. An architect designs his footings according to the best information available, and has the bidders make their proposals accordingly, eliminating all uncertainties, so that all bids will be on like quantities. The best practice does not countenance "passing the buck" to the contractor by means of such uncertain demands as:

"ROCK. Level off rock at depths indicated, and if at these levels firm rock is not found the Contractor shall excavate to greater depth until proper surface is secured."

If there is a possibility that usable sand or gravel will be found in the excavation, the superintendent may be charged with the responsibility of determining its fitness for use in concrete or mortar, thus:

"SAND AND GRAVEL. As excavating progresses, the Superintendent shall be afforded opportunity to inspect materials uncovered and may direct the separation (without additional expense) of all sand and gravel suitable for building purposes. Same shall be kept free from earth and shall be stored on premises to be used as directed. The Contractor shall allow a unit price of $2 per cubic yard for all sand and gravel so obtained and used."

Forcing the contractor to pay current prices for materials so used makes him more or less indifferent as to their incorporation in the work, and makes it simpler for the superintendent to control such usage. When the use of material from the excavation is permitted at a direct saving to the contractor, one who is unfair needs unusual watching. The unit price for extra concrete also applies in event of the discovery of some old cistern or other filled-in hole in the excavated area. If this extends below new work shown on the drawings, proper attention should be given to it. Footings should be carried to original soil under the same proviso as applies to other soils of insufficient bearing capacity, as previously quoted. If only floors occur over the old excavation, or if it is only a narrow trench crossing under a footing, such reinforcement can be added to the concrete as will guarantee safety, without adding bulk.

Thus, with premises well founded, calculations carefully made and checked, and construction adequately supervised, one is reasonably assured of satisfactory results; but, if changes are to be made from the footings as originally designed, there should be no question as to whose is the responsibility for such changes or for conditions resulting therefrom.* On compressible soils, where the spread of the footings is such that minor settlement is anticipated, one should bear in mind that such "live loads" as are imposed upon warehouse floors act as "dead loads" after coming to rest for a time. This means that, upon the completion of such a structure, it may be expected that all structural dead loads will have operated to produce their permanent effect on the footings, whereas the more or less permanent live loadings are yet to be applied. It is therefore of much import that such foundations be designed with sufficient spread to permit of minimum settlement, unequal as it is bound to be.

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* Or, if preferred, will be allowed a fixed amount per cubic yard.

* A case is on record where the building committee of a large church, employing non-resident architects, hired their own superintendent, one familiar with local conditions. He found that the footings in certain locations were inadequate on account of soil conditions, and took it upon himself to change them and so notified the architects. Later, when bad settlement cracks occurred, the owners sued the architects for heavy damages, but the latter were able to show that they had no direct knowledge of the conditions uncovered by the excavating, that the information as to the change in footings was definite and not submitted to them for approval, and that they could not be held responsible for effects after being relieved from control of the causes. Such incident affords ample testimony to the need of the owner's insistence that the superintendent or clerk-of-the-works shall always be employed by the architect, direct,—never by the owner. There should be no divided responsibility for structural design.

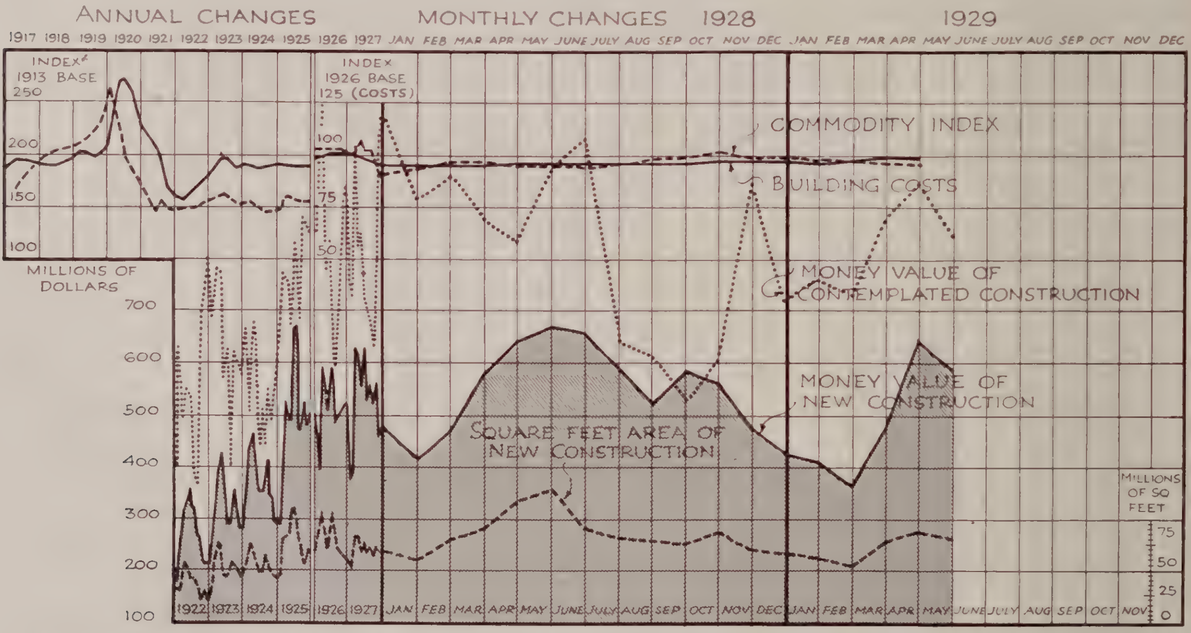
THE BUILDING SITUATION

A MONTHLY REVIEW OF COSTS AND CONDITIONS

THE anticipated increase in construction activities during the month of May has only partly materialized, a fact due in part to recent labor disputes in New York. The value of construction contracts awarded in the 37 eastern states during the month of May was, according to the F. W. Dodge Corporation, $587,765,900, a decline of 9 per cent from the preceding month, and 12 per cent lower than the total for May, 1928. Total construction for the first five months of 1929 shows a decrease of 11 per cent from the 1928 figures for a similar period.

The effect of the labor dispute in New York is evidenced in the decided falling off in contracts awarded in the New York-northern New Jersey district. The May total of $122,474,600 was 28 per cent below that of April, and 34 per cent below the figures for May, 1928. This brings the total for the first five months 24 per cent below that for 1928. The middle Atlantic states suffered a similar recession. The May figures showed contracts valued at $59,419,500. This is a decline of 44 per cent from the April total, and is 23 per cent below the total for May, 1928. In spite of these losses the volume of work awarded for the first five months of 1929 was only 7 per cent less than during 1928. The New England states May figures of $43,745,300, showed an improvement of 7 per cent over April, but a decrease of 28 per cent from May of last year. Less significance is attached to this decline when it is noted that the 1928 figures for this district were abnormally high, breaking all previous May records. Contracts for the five months were 17 per cent below the five months of 1928. With a total of $71,472,100, contracts awarded in the Pittsburgh district amounted to 17 per cent more than April and 8 per cent more than May of last year. This high figure brought the total since the first of the year up to 1 per cent above that for a similar period in 1928.

In the central western district the figures for the first five months ran 10 per cent below the five months of 1928. Nevertheless, the May figures of $199,136,400 were 18 per cent above the April record, and 3 per cent higher than May, 1928. The northwestern district shows a decided improvement when compared with either the previous month or the previous year. The May contracts amounted to $13,322,400, an amount 21 per cent ahead of the April total and 40 per cent ahead of the total recorded for May of last year.



THESE various important factors of change in the building situation are recorded in the chart given here: (1) *Building Costs.* This includes the cost of labor and materials; the index point is a composite of all available reports in basic materials and labor costs under national averages. (2) *Commodity Index.* Index figure determined by the United States Department of Labor. (3) *Money Value of Contemplated Construction.* Value of building for which plans have been filed based on reports of the United States Chamber of Commerce, F. W. Dodge Corporation and *Engineering News-Record.* (4) *Money Value of New Construction.* Valuation of all contracts actually let. The dollar scale is at the left of the chart in millions. (5) *Square Foot Area of New Construction.* The measured volume of new buildings. The square foot measure is at the right of the chart. The variation of distances between the value and volume lines represents a square foot cost which is determined, first by the trend of building costs, and second, by the quality of construction.

7 a.

THE
ARCHITECTURAL FORUM

IN TWO PARTS

PART ONE
ARCHITECTURAL DESIGN

AUGUST
1929

Hear ye! Hear ye!

Once a building is worthy of
a slate roof it is worthy of a
Sheldon Slate Roof

"The Roof of Eternal Beauty"

That costs no more and you are certain to obtain the Color, Pattern and Texture effect that is supremely befitting the design, tone and setting of the building. We respectfully offer you the expert service that has enabled many Architects to secure the Utmost in Roof Satisfaction for themselves and their clients.

F.C. SHELDON SLATE CO.
GENERAL OFFICES · GRANVILLE · N · Y ·
· BRANCHES IN PRINCIPAL CITIES ·

HANLEY FACE BRICK

Daily News Building, 41st—42nd Street and 2nd Avenue
John M. Howells—Raymond M. Hood, Associate Architects
Hegeman Harris Company, Inc., Contractors

As a relief to the pure white shaft of Hanley Glazed Brick the spandrels of this building are of rose and black colored brick. The glazed brick are self-cleaning and will accentuate the flood lighting.

Hanley Glazed Brick can be had in whites, mottled tans, greens and blues. Their cost laid in the wall is only one-third more than face brick and little more than half the cost of stone.

The usage of white glazed brick for high class office buildings is growing rapidly due to the permanent white color obtained and the dignified appearance which keeps these buildings new for a long period of time.

HANLEY

ESTABLISHED 1893

HANLEY COMPANY

Largest Manufacturers and Distributors of Face Brick in the East

BOSTON—260 TREMONT ST. BRADFORD, PA. NEW YORK—565 FIFTH AVE.

THE ARCHITECTURAL FORUM

Published Monthly by National Building Publications Division of National Trade Journals, Inc., 521 Fifth Avenue, New York, N. Y. Yearly Subscription: U. S. A. Insular Possessions and Cuba, $7.00. Canada, $8.00. Foreign Countries in the Postal Union, $9.00. Single copies: Quarterly Reference Numbers, $3.00; Regular Issues, $1.00. Entered as Second Class Mail Matter at the Post Office, New York, N. Y., under the Act of March 3, 1879.

VOLUME LI
Number 2

Yorkshire Shingle

Residence—MRS. G. B. McCORMICK,
Birmingham, Alabama.
Architects—MILLER & MARTIN,
Birmingham, Alabama.

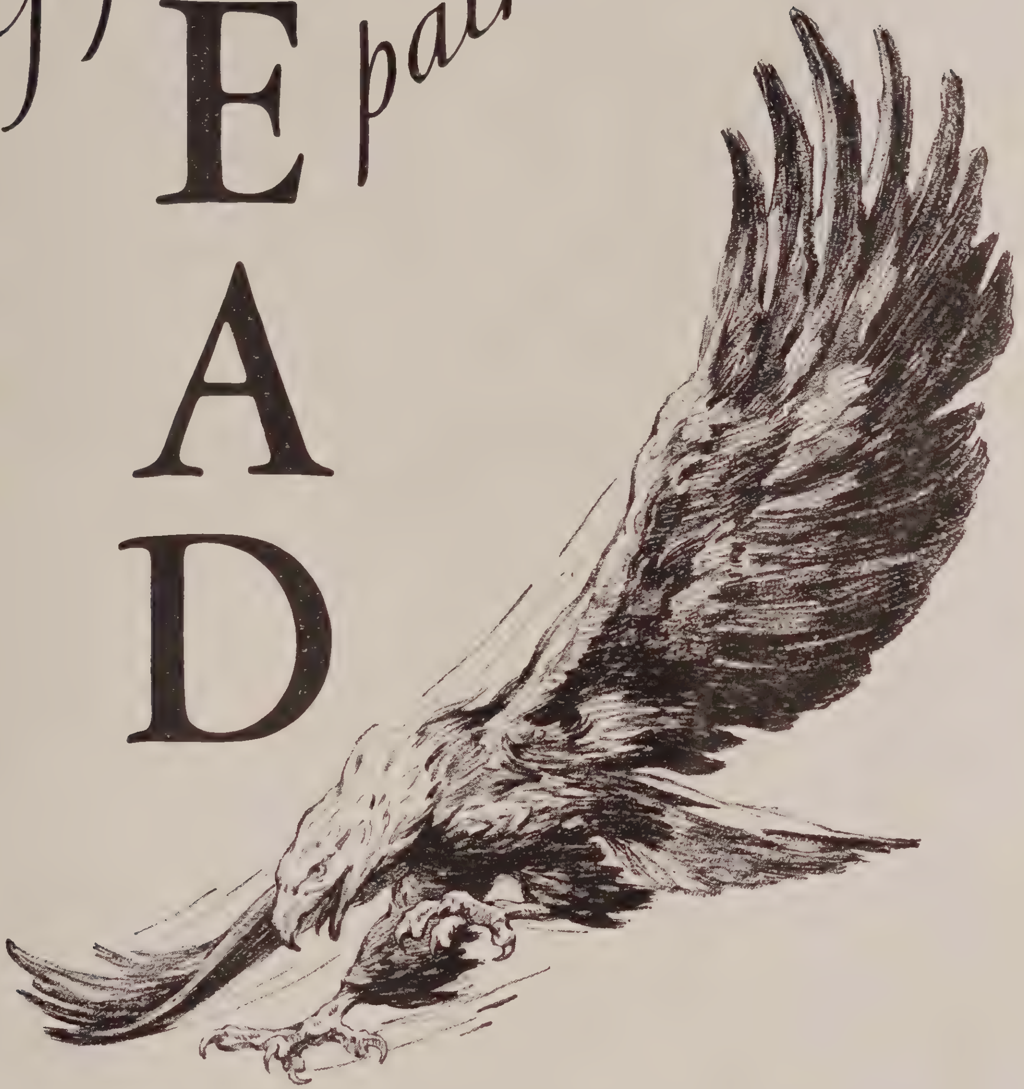
Yorkshire Shingle Tile is of a vitrified shale body with an especially burned patina of slopped color effects in a range from biscuit tans, russets, beaver browns, violet smoked grays and hundreds of incidental weathered tones of iron rust hues to smut blacks—precluding any bizarre or vibrating effect through repetition of set color mixtures. The haphazard hand battering of the butts and the incidental sanded and granular surfaces add to the architectural charm and informality. Write Dept. F., Daisy, Tennessee.

B. Mifflin Hood Company

KIL-KRAFT TILES
TRADE MARK
DAISY, TENNESSEE

Above all things use Hood Roofing Tile

Specify LEAD *paints*



"Save the surface and you save all"—Paint & Varnish

Paints with a high-lead content eliminate trouble all along the line. When a painter works with pure white lead (preferably Eagle), there is no question as to wearing quality or paint satisfaction. You and the homeowner know exactly what is going on the walls, interior or exterior. White lead meets every requirement of good painting easily—and with noticeable economy.

EAGLE White Lead

Reg. U. S. Pat. Off.

made by The Eagle-Picher Lead Company, 134 N. La Salle Street, Chicago. Producers of lead, zinc and allied products.

A View of the Roof on Kirk B. Johnson's Residence, Montecito, California—George Washington Smith, Architect

The Spirit of Cellini In Old World Tile

WHEN the great Cellini undertook a work of art for the nobility, he brooked no rivalry in merit; the job was his, not to be equalled by the mind or hand of another.

And so it is with Heinz craftsmen. They set as their goal a job that can not be equalled and are producing Old World tiles today which in coloring, shape, and texture are so perfect that artists more exacting than "Cellini's Nobility" have judged them as masterpieces.

Note carefully the texture and shape of the tile above—how butts and edges have been skilfully shaped and molded by hand—how the surfaces of each have been carefully washed and sanded. In coloring, these tile were made expressly for George Washington Smith and are genuine to those found in the Old World—dark greens, blacks, dark and light Burgundies—Tints of Mediterranean blue can be detected here and there—the blending and variety of colors so softly mingled that upon observation one would say they had been painted by the hand of an artist.

Write Heinz today for samples of these Old World Tiles—the "RONDA," as shown above with special Italian pans—or the "PLYMOUTH," used by famous architects in all parts of America. Perhaps you will wish a special tile or a special color, an accomplishment you will find Heinz eager and interested in carrying to a completion for you. *Write today.*

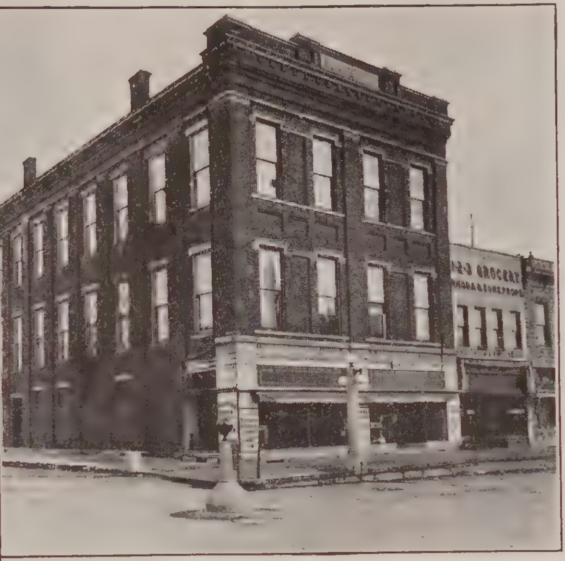
THE HEINZ ROOFING TILE CO.

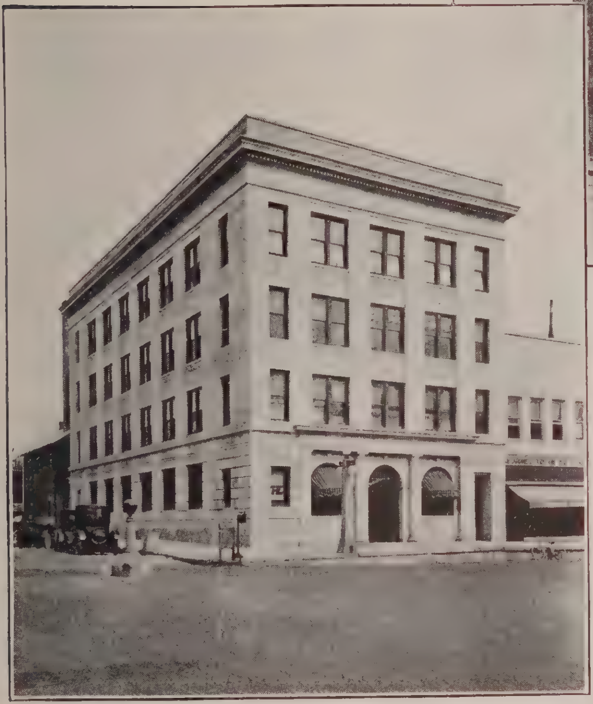
DENVER, COLORADO 3659 COUNCIL ST., LOS ANGELES, CALIF. 101 PARK AVE., NEW YORK

New Fronts for Old

Before. *Stone City Bank Building, Bedford, Indiana, before remodeling.*

After. *The same building after refacing with Gray Indiana Limestone. E. E. Dunlap Co., Architects.*





Have you any remodeling jobs in view? Let us tell you about how other architects are using Indiana Limestone for this purpose.

THERE is under way, says a leading publication in the business field, one of the most extensive remodeling programs in the country's history.

We feel sure that this fact merits the attention of architects in every locality. When jobs of this kind come into your office, are you trying to do something distinctive and unusual? We have and are assembling for your benefit photographs of interesting examples of such work. Let us send you some of these when you have a remodeling job on the board.

Indiana Limestone certainly is an ideal material for the remodeling of building exteriors. Dark, unattractive exteriors can be transformed "like magic" by the use of this beautiful, light-colored natural stone.

A new facing of some common material is not enough. The remodeled building needs that little "plus" of the very finest exterior in order to be successful. Natural stone will give it the necessary "class."

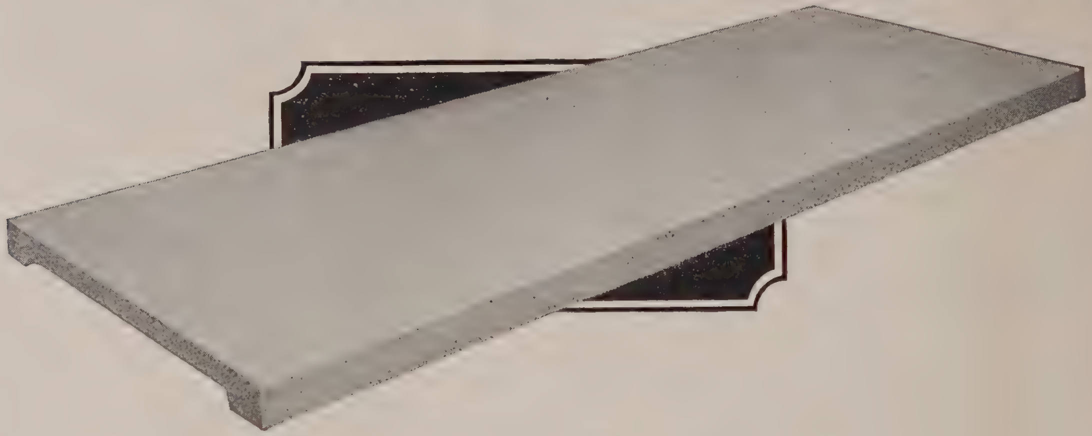
The exceedingly fine results achieved by remodeling old buildings with new fronts of Indiana Limestone are showing the building owner how easy and economical such remodeling is. There is sure to be an increasing demand for this sort of work.

We will gladly co-operate with you in planning new store fronts and other kinds of remodeling jobs in Indiana Limestone. Write us.

INDIANA LIMESTONE COMPANY

General Offices: BEDFORD, INDIANA *Executive Offices:* TRIBUNE TOWER, CHICAGO

A New Era in Roof Construction



Featherweight Concrete INSULATING ROOF SLABS

TODAY the concrete roof-deck offers greater advantages than ever before—through the advent of the light weight aggregate, Haydite—*producing a slab of great strength that weighs but 10 lbs. per sq. ft. and that possesses, in addition, marked insulating value.*

This outstanding development, tested under many years of actual service and proven worthy of the Federal reputation, introduces a new era in roof construction—new values heretofore unobtainable — new savings in supporting steel—in fuel and radiation.

Presenting

Featherweight Concrete INSULATING ROOF SLABS

FEDERAL CEMENT TILE COMPANY CHICAGO

NEW BOOK NOW READY!

The Federal concrete roof-deck has proven its superiority over a quarter century of permanent, fireproof, no-maintenance service. American industry has grown up under this roof—prominent railroads have used it extensively—many of the country's finest public buildings are safeguarded by it.

For complete description, illustrations and up-to-date structural details of *Featherweight Concrete* Insulating Roof Slabs, write for new 36-page "Catalog and Roof Standards," now available, without obligation.

Made, Laid and Guaranteed by

FEDERAL CEMENT TILE COMPANY

608 South Dearborn Street Chicago

FOR OVER A QUARTER CENTURY

Buffalo Central Terminal
New York Central R. R.
Buffalo, N. Y.

Alfred Fellheimer *and*
Stewart Wagner
Architects

PASSENGER Concourse of New York Central Station, Buffalo, where ideal acoustic conditions and permanency of construction have been achieved by the installation of AKOUSTOLITH sound absorbing tile as soffit course to tile ceiling vaults.

R · Guastavino Company

40 COURT ST., BOSTON, MASS.
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R. GUASTAVINO CO. OF CANADA, Ltd.
New Birks Building, Montreal, P. Q.

The Most Appropriate Roof

FOR STRUCTURES OF ITALIAN INFLUENCE ARE THESE REPLICAS OF OLD ITALIAN TILES

CASA ITALIANA, COLUMBIA UNIVERSITY GROUP, NEW YORK CITY. McKIM, MEAD & WHITE, ARCHITECTS

McKim, Mead & White chose for their distinguished Casa Italiana a roof of Imperial Tapered Mission Tiles . . . Rough in texture and mellow in color, these tiles are accurate reproductions of those laid centuries ago on the palaces of the Medicis . . . In its lasting qualities the roof of the Casa Italiana should rival the ancient tile roofs of the Old World . . . Rarely if ever will it require repairs, nor will its soft, warm hues ever fade.

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Makers of IMPERIAL Roofing Tiles

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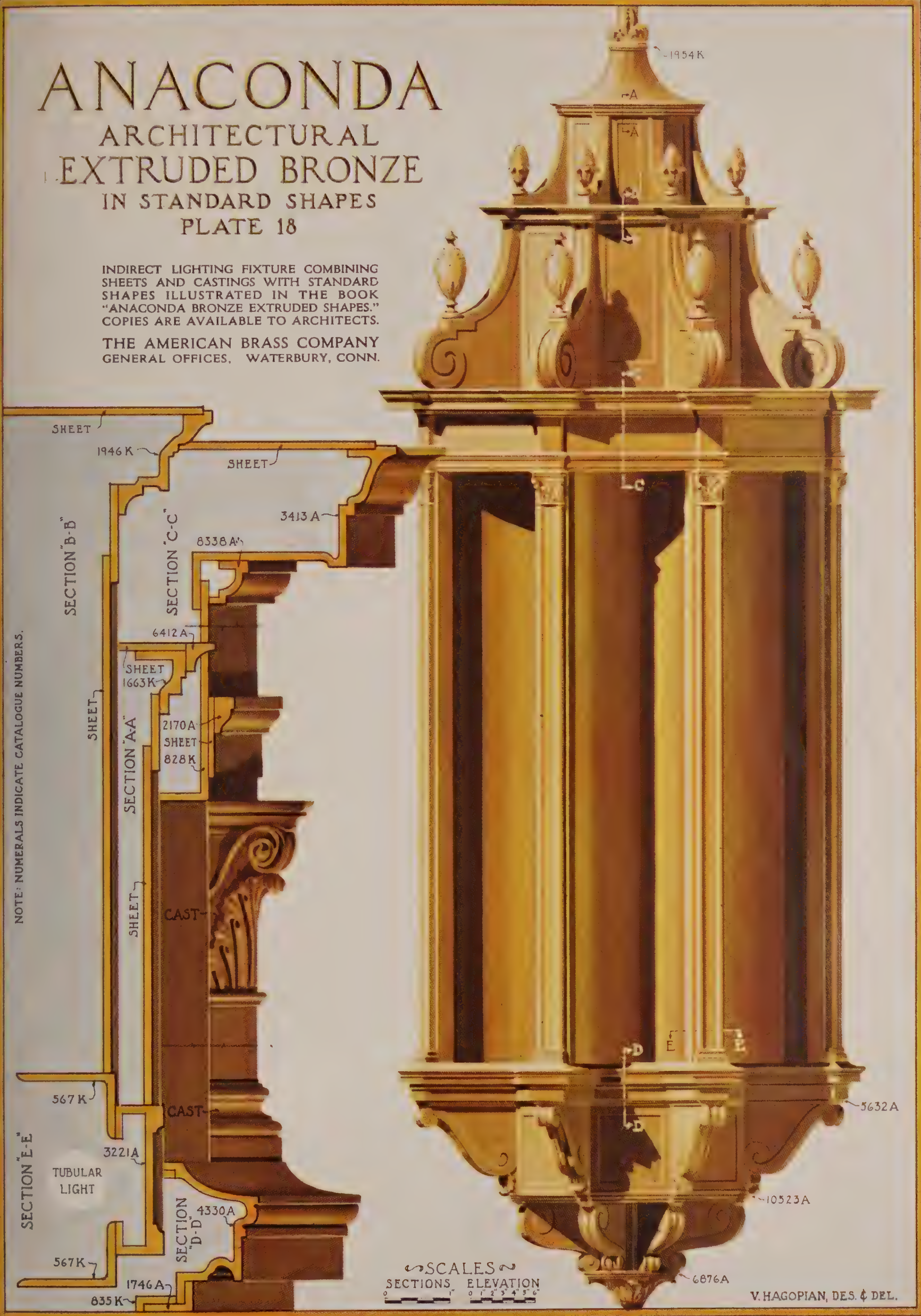
ANACONDA
ARCHITECTURAL EXTRUDED BRONZE
IN STANDARD SHAPES
PLATE 18

INDIRECT LIGHTING FIXTURE COMBINING SHEETS AND CASTINGS WITH STANDARD SHAPES ILLUSTRATED IN THE BOOK "ANACONDA BRONZE EXTRUDED SHAPES." COPIES ARE AVAILABLE TO ARCHITECTS.

THE AMERICAN BRASS COMPANY
GENERAL OFFICES, WATERBURY, CONN.



Complete sets of these plates may be had for the asking

The Invisible Superintendent at the Mortar Box *Makes Possible*

One Mortar for all Masonry

IT IS unnecessary to specify special mortars for different kinds of brickwork. The simple BRIXMENT mix—one part BRIXMENT, three parts sand (no lime, no portland cement)—makes a mortar suitable for *all* masonry.

Tested in piers, its strength approaches that of straight 3-to-1 portland cement mortar. This makes it suitable for foundation, load-bearing or parapet walls and even for tall, free-standing stacks.

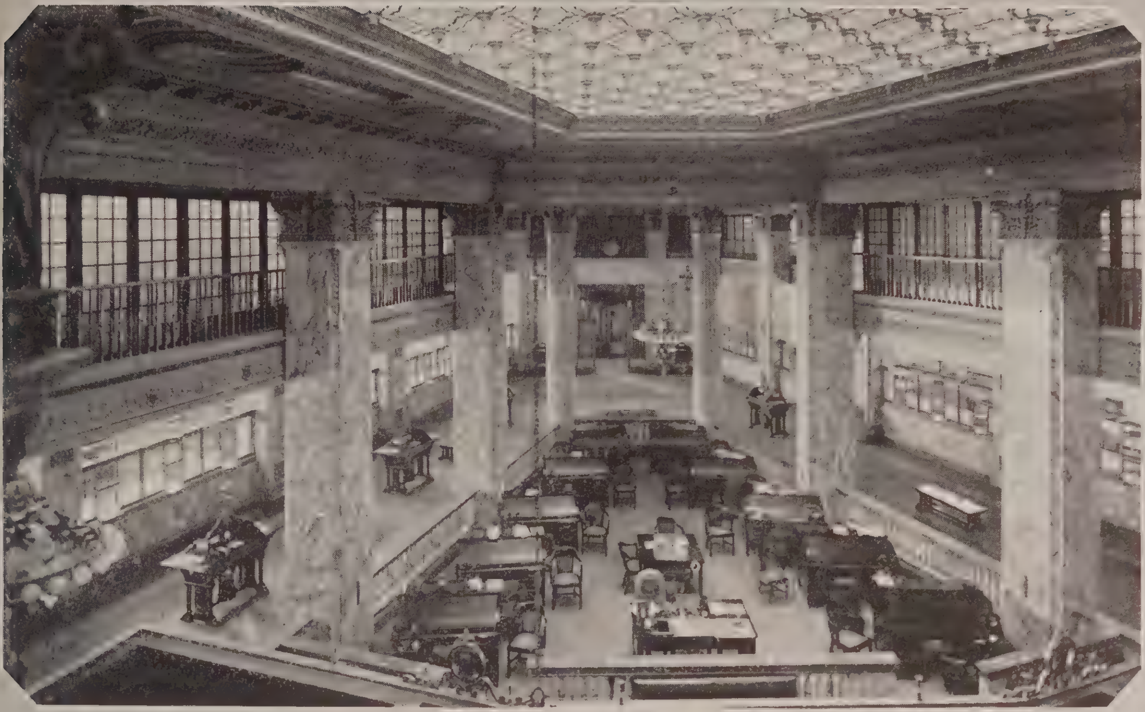
Since it is hydraulic, water-repellent and used without lime, it is ideal for walls below grade. . . . Since it helps prevent efflorescence and fading of mortar colors, it is especially desirable for use with face-brick. . . The economy resulting from its low cost and plasticity justifies its use in backing-up and in partition walls. . . Architect's handbook on request. Louisville Cement Company, *Incorporated,* Louisville, Ky.

District Sales Offices: 1610 Builders Bldg., *Chicago;* 301 Rose Bldg., *Cleveland;* 602 Murphy Bldg., *Detroit;* 101 Park Ave., *New York*

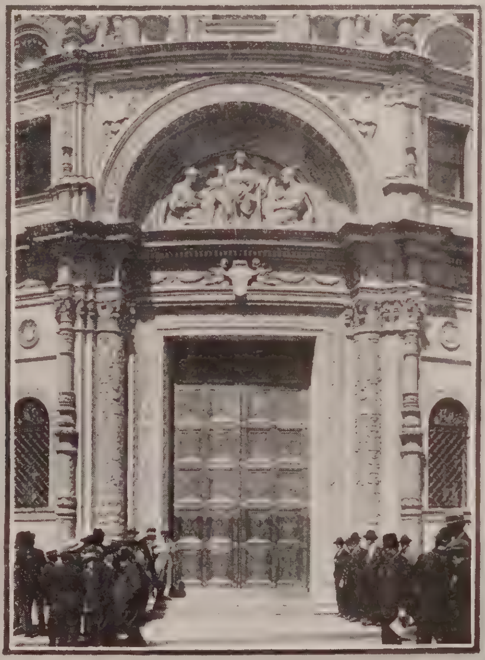
BRIXMENT

for Mortar and Stucco

The unusual plasticity of BRIXMENT mortar makes it especially well suited for setting tile and block because of the long cross-joint used in such work.

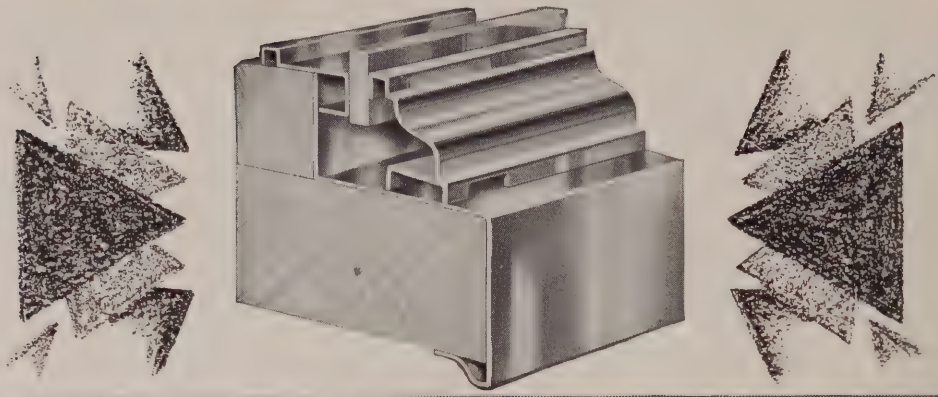


Chambers & Thomas, Buenos Aires, Architects.
York & Sawyer, New York, Consulting Architects.



The interior of The First National Bank of Boston building in Buenos Aires is finished in porphyry and green and yellow Uruguay marble. Its spacious dignity is in keeping with the character of this banking institution.

STONE & WEBSTER
ENGINEERING CORPORATION
Builders



PERMAWITE

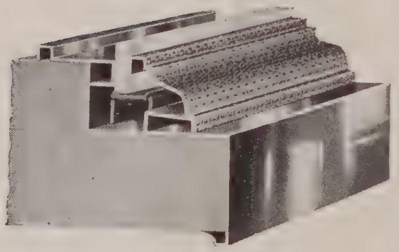
CHROMIUM-LUSTRE *Solid* WHITE METAL

BRASCO'S latest advance in store front construction, catering to the present-day vogue for an all-white metal framing around the brilliant show windows of the modern shop.

This product is of *solid* metal. It retains its flashing chromium-lustre whiteness, because of its remarkable resistance to wear and weather. *And all at a cost actually lower than plated metal.*

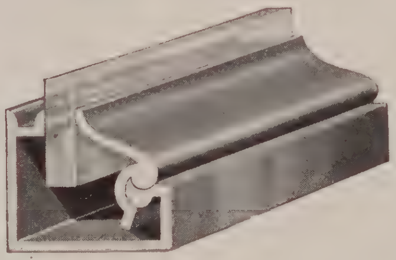
Brasco construction is built solidly of heavy-gauged metals, on time-proven principles of safety to the plate, permanent beauty, ease of installation, adequate ventilation and drainage.

Full-sized details and actual samples of Brasco Series 500 Sash and Bars in PermaWite, Art Bronze, Copper or Bronze, and Davis *Solid* Architectural Bronze, are available on request.



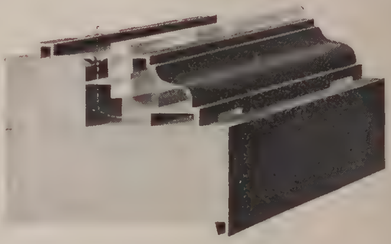
BRASCO
ART BRONZE

Offering a distinct contribution to modern store architecture with its striking patterned effects in deep relief.



DAVIS
SOLID BRONZE

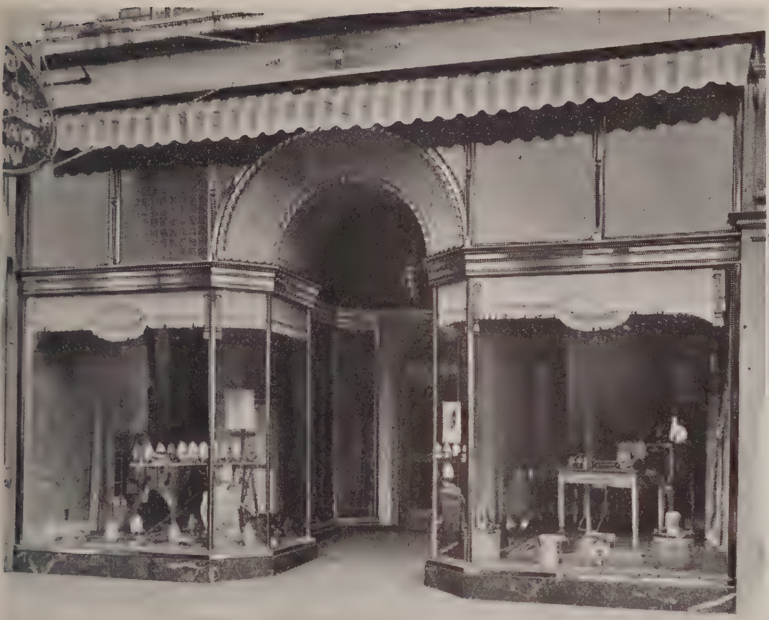
Without a par today for the finer stores of modern buildings. Built on the fulcrum principle of indirect screw pressure, it assures utmost safety to the largest plates. All glass is set from the outside without need for putty or plastic cement.



BRASCO
COPPER OR BRONZE

The metals of proven merit, serving successfully on thousands of Brasco store fronts all over the country.

Brasco

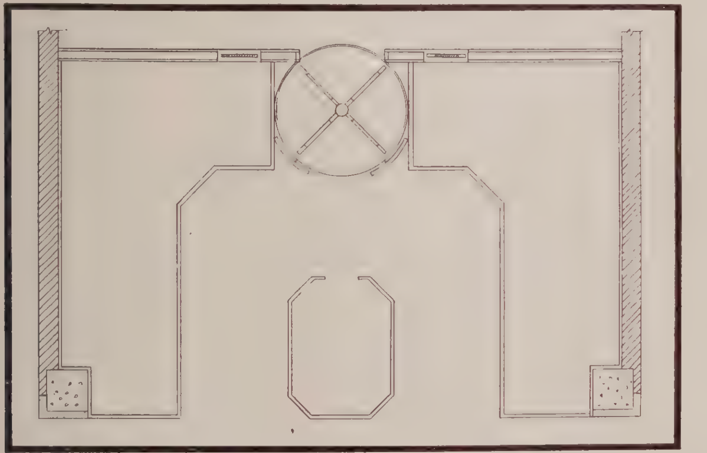


The attractive store of the Illinois Power and Light Co. at Ottawa, Ill., set in Brasco construction. Note how effectively this layout utilizes the space for full, efficient display. Architect: John Hanifen; Brasco by Rugg Glass Co.

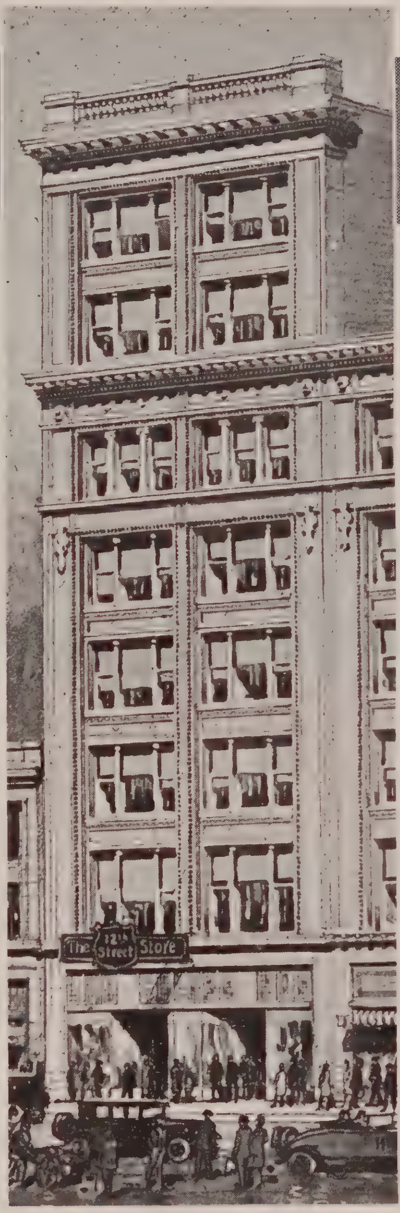
BRASCO MANUFACTURING CO.

5031 Wabash Avenue, Chicago

28-14 Wilbur Ave., Long Island City Commonwealth Building, Philadelphia



The design of this front for the Twelfth Street Store addition embodies an island show case, flanked by a broad expanse of show windows leading to the concealed doorway. All plate is beautifully framed in Davis Solid Architectural Bronze. Architect and Engineer: A. Epstein; Contractor: L. Balkin.

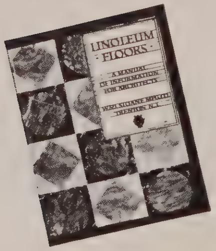


Addition to the big Twelfth Street Store, Chicago, with store front construction of Davis Solid Architectural Bronze. (Plan at left.)

Store Fronts

Reception room in offices of Anderson, Davis & Hyde, Inc., New York. Double-waxed *linoleum, made by W. & J. Sloane, installed by Simon Manges & Co.*

Why the Specifications Called for DOUBLE-WAXED LINOLEUM



This Service Free to Architects

We maintain a service department to assist architects in planning or specifying linoleum floors. This service is at your disposal without charge. Write for copy of Architects Data Book and ask for representative to call if you wish advice on specific problems. Address: Architects Service Department, W. & J. Sloane, 577 Fifth Avenue, New York City.

BUYERS of large quantities of linoleum for office buildings, hospitals, etc., insist upon one feature which is not adequately covered in the Government specifications. That feature is a fine, smooth, non-porous finish.

To produce such a finish two things are essential. First, the quality must be built in the goods by finer grinding and mixing of the ingredients and by extra pressure in the calendars. Second, the linoleum must be waxed.

Expert handlers of linoleum agree that there is no substitute for waxing as the proper surface finish. It improves the appearance of the floor, simplifies and lessens the cost of maintenance and lengthens the life of the linoleum.

When you specify W. & J. Sloane Linoleum you receive linoleum which has been *double-waxed at the plant.* It is easy to handle and lay and ready for use the instant it is laid. Be sure to inspect this fine finish before you write the specifications. We will gladly send you a quality sample.

W. & J. SLOANE
Double-Waxed LINOLEUM

STORE · FRONTS
BY
ZOURI
IN
ROLLED BRONZE
ROLLED COPPER
EXTRUDED BRONZE
CHROMIUM PLATE

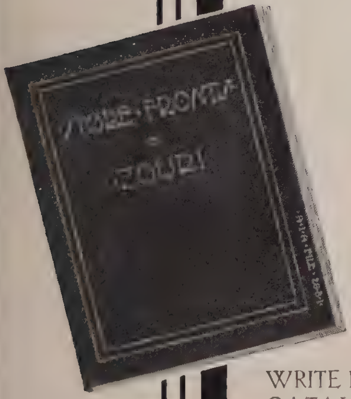
Electrolytic Finishes
Bronze Doors and Windows
Licensed Chromium Equipment

Zouri Drawn Metals Company

AND ASSOCIATED COMPANIES:

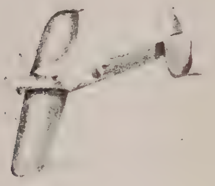
INTERNATIONAL
INTERNATIONAL STORE FRONT COMPANY
STANDARD STORE FRONT CONSTRUCTION CO.
MODERN BRONZE STORE FRONT CO.
ZOURI COMPANY OF CALIFORNIA
ZOURI DRAWN METALS CO., OF NEW YORK, INC.
DISTRIBUTION

Factory and General Offices: Chicago Heights, Illinois



WRITE FOR
CATALOG

Aeronautics calls for your expert counsel



Through the timely airport competition of the Lehigh Portland Cement Company

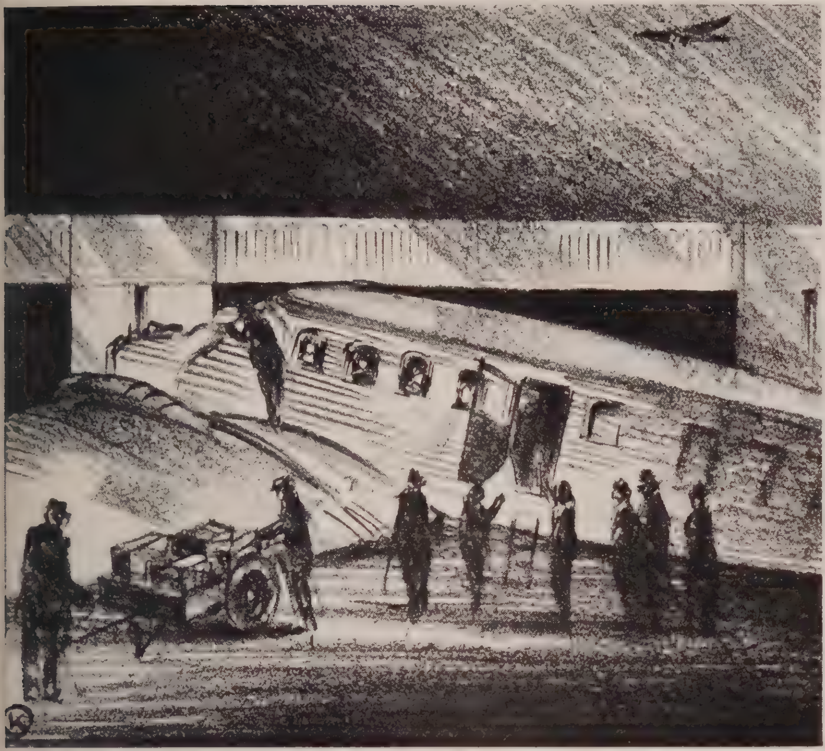
The need of more adequate thought to airport expansion plans for today's and tomorrow's air traffic has taken rank as a national emergency. Because of the importance of the problem, we have been privileged to gather together for the Program Committee of the Lehigh Airports Competition what is perhaps the most outstanding body that ever guided a prize competition.

The Committee includes more than 25 recognized authorities in architecture, engineering, civics and city planning, and aeronautics. Every one of these men welcomed the opportunity to serve. Every one of them expects the competition not only to provide new and inspiring airport designs, but also to stimulate professional study of airport problems and arouse public recognition of the necessity for sane airport development.

The terms of the competition have been formulated by the Committee in a manner best to serve the interests of architects, engineers, and the aeronautics industry. Each entry will consist of two drawings rendered in black and white in any medium. Each drawing will include two principal elements. The four major elements are: a small-scale plot plan of ground area; block plans of the structures needed to house the present and future facilities of a complete airport; an airplane perspective, showing principal structures in relation to flying area and to the traffic arteries serving the port; and an elevation and detail of the major structures at larger scale.

All structural features shall be indicated as constructed of Portland Cement products wherever practicable. Further specifications, including size of ground area and type of accommodations—which are to be designed for airplane rather than lighter-than-air traffic—are listed in the Competition Program. Programs have been mailed to architects and engineers; if you have not received your copy and wish to enter the competition, write or wire the Lehigh Portland Cement Company.

The Jury of Awards, consisting of the Chairmen of the four sections of the Program Committee and other members selected by them, will judge each entry for excellence of design, practicability from an engineering and an aeronautical standpoint, and ingenuity in the development of the principal structures and their disposition with respect to the landing area best to serve the air traffic of today and the immediate future.



The timeliness and public importance of this competition, and the thousands of airports needing competent professional counsel which are to be constructed in the next few years alone, warrant the participation of every architect and engineer in the United States. Upon completion of the contest, the winning designs and those receiving honorable mention will be widely published for the guidance of municipalities and all organizations interested in airport development.

PROGRAM COMMITTEE

Harvey Wiley Corbett, F. A. I. A., *General Chairman*
Francis Keally, A. I. A., *Professional Adviser*
C. Stanley Taylor, of Taylor, Rogers & Bliss, Inc., *Manager*

The Program Committee, which also serves as an advisory body during the period of the competition, is divided into four sections —Architecture, Engineering, Civics and City Planning, and Aeronautics, and includes the following men of outstanding prominence.

Architectural Section

Harvey Wiley Corbett, F. A. I. A. and F. R. I. B. A., Chairman
Prof. Wm. A. Boring, F. A. I. A., Dean of the School of Architecture, Columbia University
Raymond M. Hood, A.I.A., A.D.P.L.G.
Parker Morse Hooper, A. I. A., Editor, *The Architectural Forum*
Francis Keally, A. I. A., Professional Adviser

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Gavin Hadden, C. E.
Harold M. Lewis, Executive Engineer, Regional Plan of New York and its Environs
Francis Lee Stuart, Consulting Engineer

Civics and City Planning Section

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Harold S. Buttenheim, Editor, *The American City*
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Porter Adams, Chairman of Executive Committee and past President, National Aeronautic Association
Major John Berry, Manager, Cleveland Municipal Airport
Colonel Harry H. Blee, Chief of the Division of Airports and Aeronautic Information, Department of Commerce
L. K. Bell, Secretary, Aeronautical Chamber of Commerce
Colonel Paul A. Henderson, Vice-President, Transcontinental Air Transport, Inc., Vice-President, National Air Transport, Inc.
Charles S. Jones, President Curtiss Flying Service
Major Ernest Jones, Aeronautic Expert, Editor Official Bulletin Aeronautics Section, Department of Commerce
Harry Schwarzchild, Publisher, *Airports*

Lehigh Portland Cement Company

Allentown, Pa. Chicago, Ill.

LEHIGH CEMENT

MILLS FROM COAST TO COAST

COMPETITION Closes Nov. 18, 1929

$10,000 in prizes

Fourteen prizes will be awarded to the winning designs

First Prize	**$5,000**
Second Prize	**2,500**
Third Prize	**1,000**
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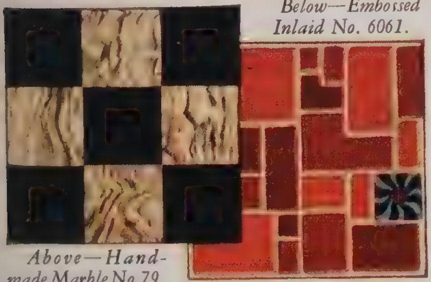

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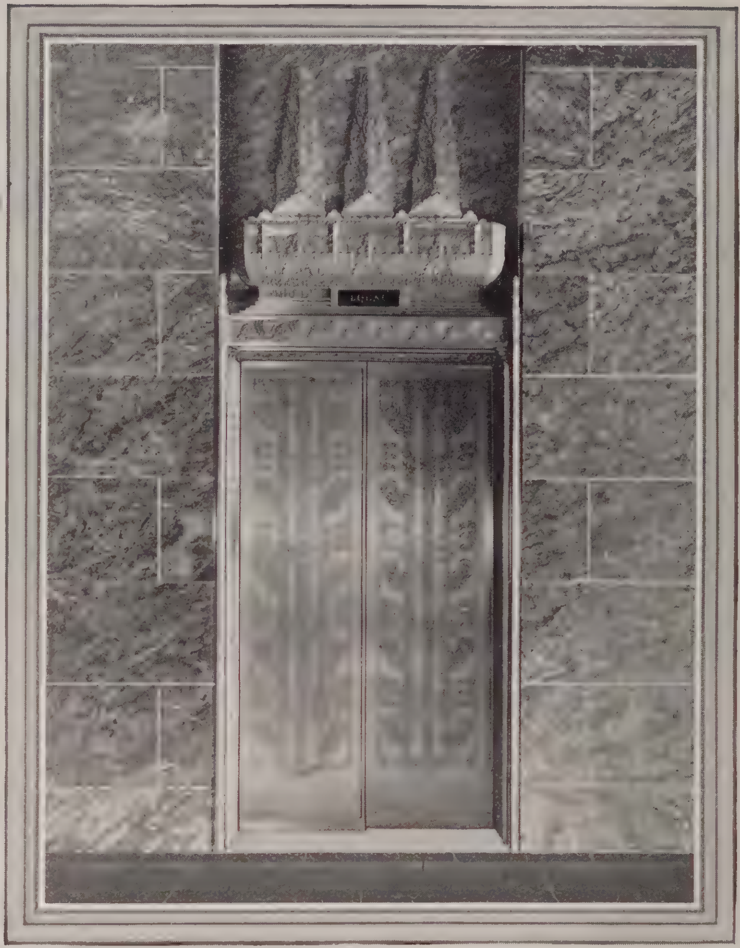

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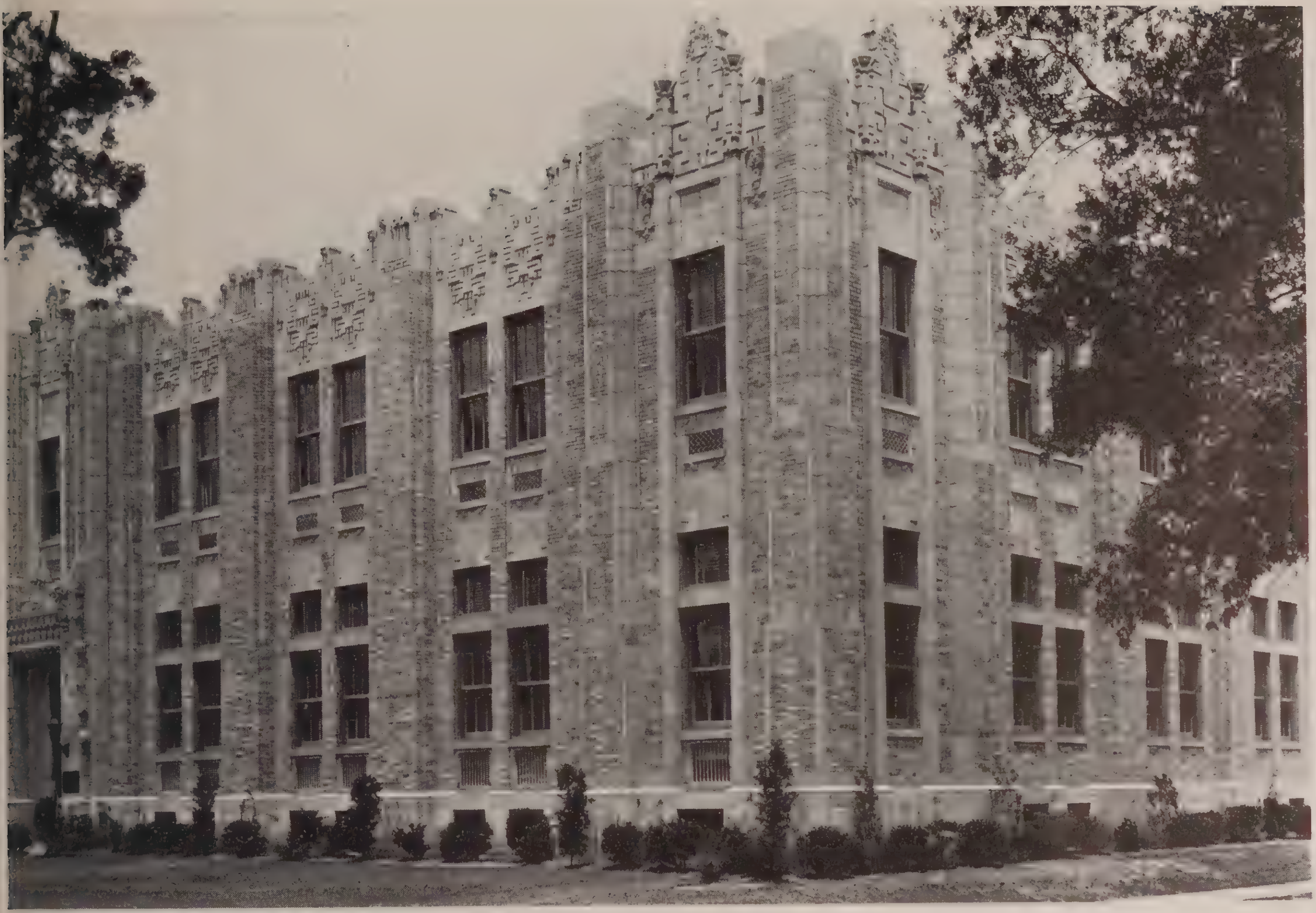

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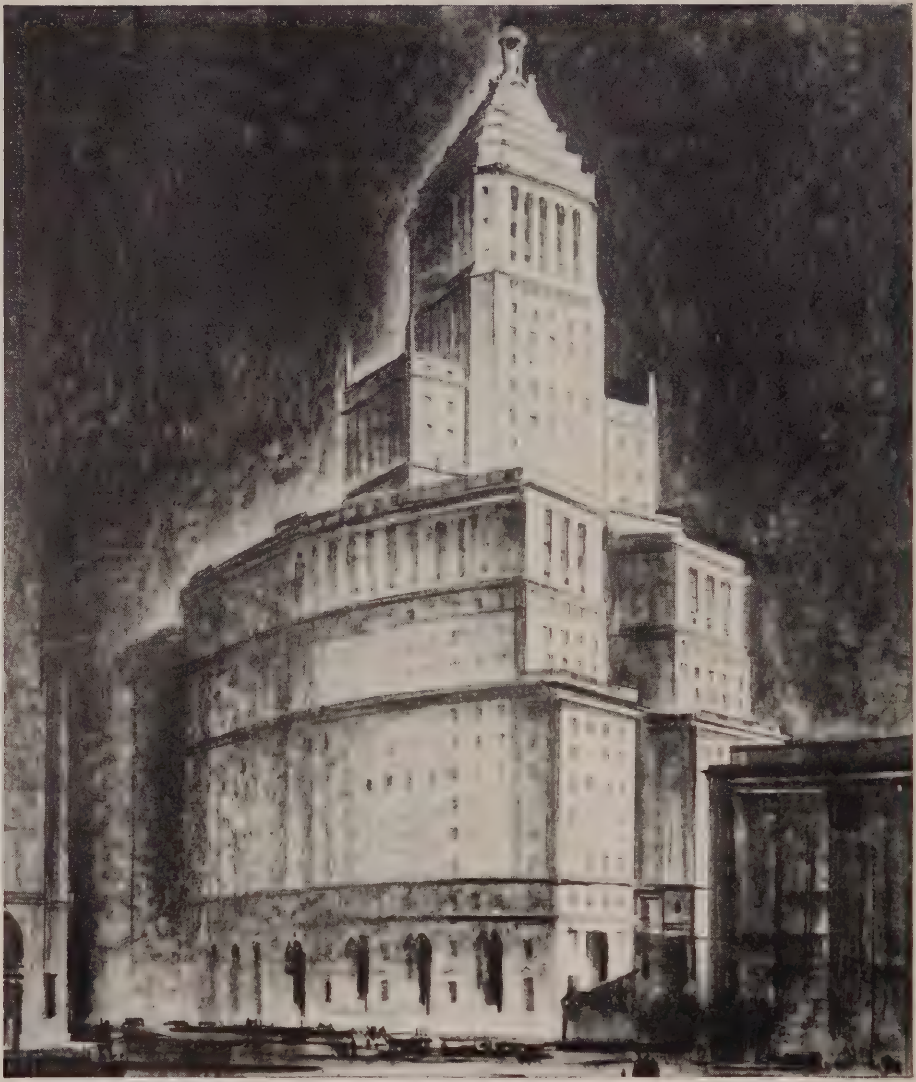

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An interesting close-up perspective of the tower finial will be found on the opposite page.

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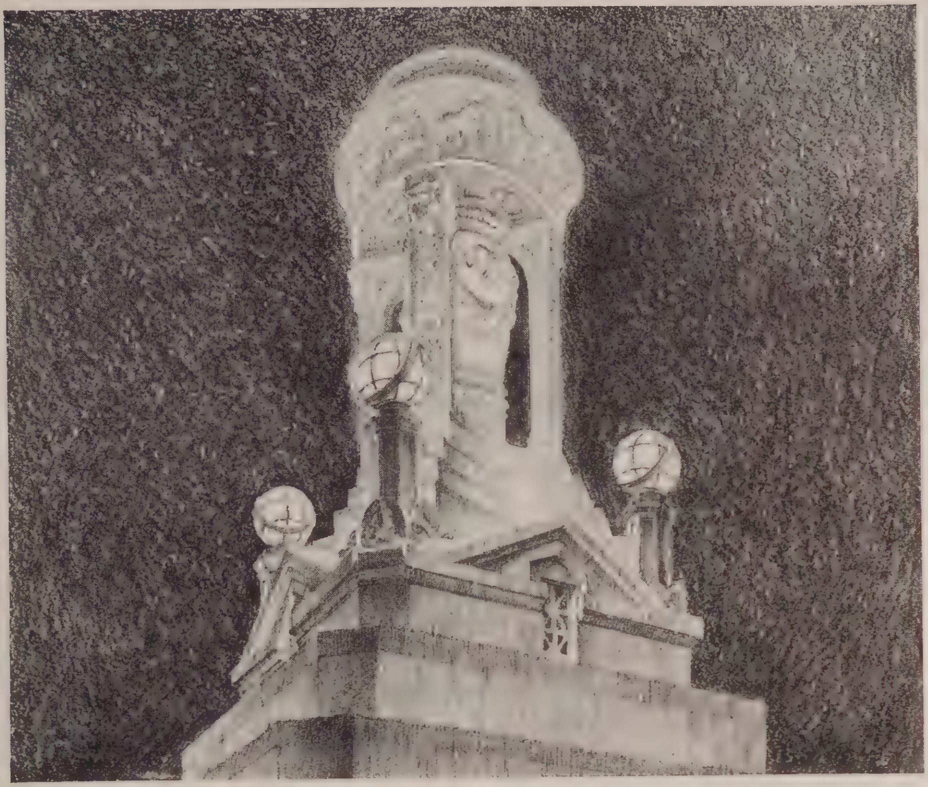

A close-up perspective of the Aluminum tower finial and navigation globes that crown the Standard Oil Building, shown on the opposite page.

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[Plan and elevation detail, and specifications for the tower finial will be found on page 120.]

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BOOK DEPARTMENT

COLLEGE ARCHITECTURE IN AMERICA

A REVIEW BY

WALTER KNIGHT COLE

THE authors of this work on "College Architecture in America" give as its *raison d'etre* the statement: "There is no art in which this country has made more rapid strides than architecture, and our institutions of learning should exemplify this national progress, especially since it so effectively ministers to all other arts as well as to science and to daily life." Indeed it is not hard to understand that a lasting influence can be brought to bear on the whole future lives of students in institutions of learning by surrounding them with scenes of real natural beauty and architectural character. Such students are usually at an impressionable period of their lives, and it is during this period that much of their taste for art and literature, whether it be good or bad, will be formed. Added to this are purely practical considerations having to do with the advertising of the institution. The colleges of the country have come to realize that in order to remain popular in the face of so much competition as now exists it is necessary to adopt some of the advertising tactics commonly employed to keep certain commercial products in the public eye, and good architecture does this well.

Music Building, Smith College
Delano & Aldrich, Architects

While the more sensational method of college advertising consists largely in the assembling and developing of successful athletic teams, a much more lasting and dignified means of attracting public interest is by presenting an exterior appearance of true æsthetic and architectural worth, embodying something of the dignity and character of the institution that occupies the buildings. The fact that good architecture is one of the best advertising media in existence has long been well known to the leaders of industry. It is said that in the period immediately following the erection of the Woolworth Building in New York, the Woolworth organization experienced a tremendous expansion throughout the entire country. Although it is possible for but few to write their names at the topmost point of the Manhattan skyline, many have succeeded in gaining much desirable publicity through housing their offices or plants in buildings having distinguished or unique architectural character, a good example of the latter being the American Radiator Building. The same principle applies in the matter of presenting the merits of a particular institution of learning to public attention. Since the contact of a vast majority of persons with colleges consists solely of a passing view or an excursion through the buildings, the importance of an attractive exterior is evident. If the institution greets the eye with a medley of dreary, obsolete structures the impression gained is naturally not at all favorable, whereas, on the other hand, a well ordered college campus with beautiful, dignified academic structures excites popular admiration and gains for the institution a feeling of respect which would be hard to impart in any other manner likely to be adopted.

Another matter contributing to the importance of having good architecture in college buildings is the fact that the buildings form the only really tangible part of the institution and are most important in maintaining contacts between the graduates and their alma mater. The personnel of a college changes rapidly, and new faces replace the old, but beautiful old buildings remain throughout the years to greet the returning alumni and bring back memories of bygone days. For all these reasons it is important that the problem of laying out a new college or adding new buildings to the plant of an old institution should be given a great amount of study. The buildings differ from those used for commercial purposes in that they will in all probability be in use for several centuries, whereas the average life of a commercial structure extends only over a few decades at the most. Therefore college buildings must be planned with a view to great permanence and as far as possible to meet the changing needs and conditions that are likely to arise throughout years to come. Their planning must take into consideration a vast number of controlling factors, such as the traditions of the school and the type and topography of the site as well as the kind of instruction to be given; as already said, provision should always be made for future growth and changing needs, and due regard be paid to the character of the student body which is to use the buildings.

The present era has been marked by a greatly increased tendency on the part of large numbers of young people to seek higher education, so that there has been an unprecedented rush of students to colleges and universities throughout the country. The older institutions have had to add greatly to their physical equipment, and an unbelievable number of brand new colleges have been

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springing up. In the past it has been too often the cas in the construction of college buildings that the mone spent has been wasted on structures which are not onl unsightly but impractical and poorly suited to the requirements of utility, with the result that our campuse are dotted with buildings which the authors of the present work describe as a "blot upon the scene that evoke the unholy impulse in some secret breast to pray for fire." Most of these buildings, it is true, were constructed during the dark ages of American architecture. Many of the early college buildings were extremely fine examples and include such masterpieces as the structures designed by Thomas Jefferson for the University of Virginia, and Philip Hooker's Hamilton College Chapel, and the earliest college building in America, built at William and Mary College after designs by Wren. At Dickinson College the old West College building was designed by Benjamin Latrobe, and at Rutgers the Queens Building was the work of John McComb, Jr. The way in which these fine old examples have endured to glorify the names of their designers should inspire present-day architects to strive to perpetuate the ideals of present-day architecture in work that is so likely to be enduring and therefore of such great importance.

Since orderliness is the first requisite of all art as well as of education, this is one of the most desirable qualities to be embodied in a group of college buildings, not only for the effect it has upon the developing minds of the students, but for the pleasing appearance it imparts to the general scene. Architectural confusion detracts more from the beauty of American cities than any other single factor and is a phase of architecture that should receive much more serious consideration. In the field of college architecture a great deal has recently been accomplished in the way of preparing preliminary comprehensive plans for the layout and development of college groups. It may be said that Thomas Jefferson was the first to prepare a well ordered general development plan by laying out a complete group of buildings for the University of Virginia. The idea was not generally followed, however, and for a long period colleges were allowed to develop along haphazard lines by adding buildings from time to time as the need was felt. The practice of orderly planning was revived and given new impetus by the complete designs for Stanford University by Shepley, Rutan & Coolidge. Since that time it is likely that practically every college in the country has obtained for itself some sort of prospective plan for the future layout of its buildings. Since it is such a difficult task to foretell accurately what the future needs and conditions will be, these general development plans are adopted in principle only and are subject to change at any future time. They do, however, furnish a definite basis on which to proceed and help greatly in solving the problem of combining the teaching, housing and recreational facilities in one group of buildings. The æsthetic advantages arising from the use of such a general development plan are incalculable, since in this way each structure is made to harmonize with the others, and the entire group is given the quality of orderliness, whether the plan adopted be formal or informal and rambling, according to site and conditions.

The volume entitled "College Architecture in America," by Charles Z. Klauder and Herbert C. Wise treats the subject of college buildings in a most complete manner. It is the result of much study and investigation on

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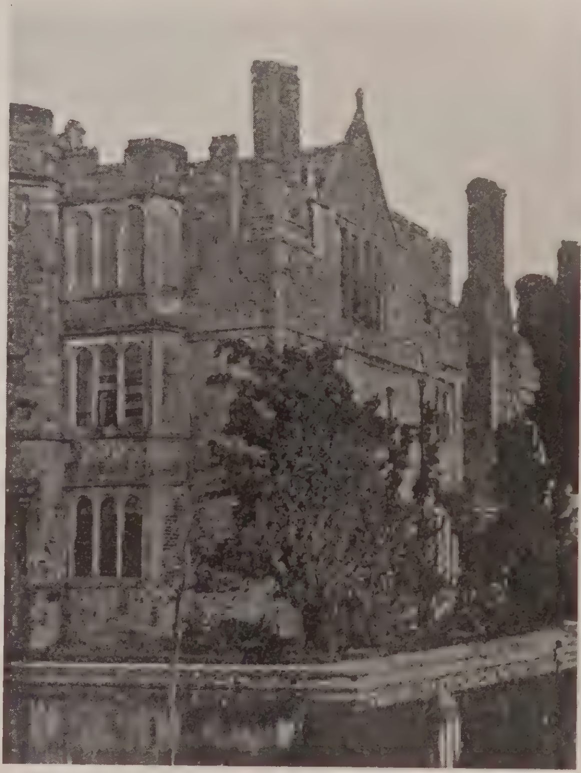

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¶ "Garner and Stratton" invariably comes into use when an architect is working in the Tudor, Elizabethan or Jacobean style. Its brilliant illustrations of old buildings may be depended upon to afford precedent for modern work and to supply inspiration for adapting these marvelous styles to present-day use. The difficulty of securing the two volumes, their unusual size, and the fact that they have dealt chiefly with elaborate work have hitherto prevented their wider use.

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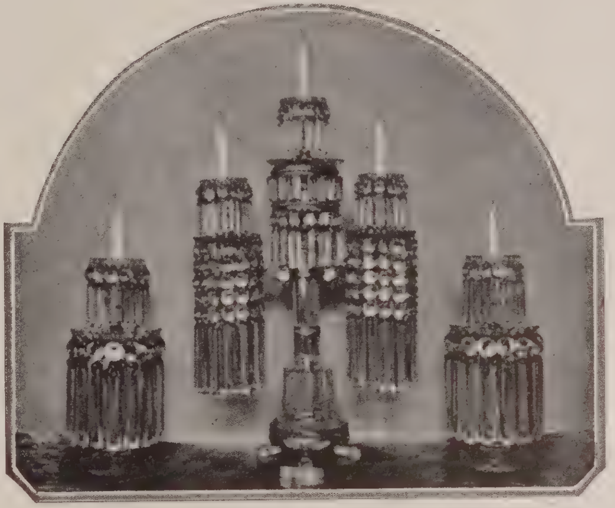
the part of the authors, who visited over 70 institutions personally and spent much time in writing for and receiving information from those they were unable to visit personally. Their positions as leading architects of college buildings make them particularly well fitted for the task of bringing together all available information, and it is felt that they have contributed something really worth while to the field of college architecture. There are 217 illustrations from plans and photographs, and the text discussion of the various classes of buildings is very complete. The more notable examples of old college structures are shown, and the story of college architecture from the beginning is well told. The general principles and controlling factors in relation to college buildings are discussed and give an idea as to the way in which the problem of college planning should be approached. The important subject of general development plans is also well covered by illustrations and text descriptions. The various classes of buildings are then treated separately, each in a chapter of its own. Administrative office buildings form the nerve centers about which a college or university functions, and they should be planned so as to centralize all departments in as efficient a manner as possible. The authors, under this heading, discuss the administrative buildings in many colleges, pointing out their advantages and disadvantages by the use of illustrations and floor plans. The structures to be used for academic purposes exclusively form another important class of buildings, and the laying out of classrooms and special departments is of great importance to the proper functioning of the educational department. Here again much careful consideration must be given to probable future conditions and provision be made for possible expansion. A wide variety of such buildings ranging from the skyscraper school of commerce at Northwestern University, to the small building housing the law school at Emory University are shown.

The library is, as the authors describe it, "the intellectual power plant of the college or university; it is related to all departments and it must keep pace with all departments in supplying to each branch of study the books and references needed. Hence it must be sensitive to the expansion of any teaching unit of the university." The designing of libraries is a highly specialized field of architecture, and the examples shown and discussed here present a good idea as to how the library should be adapted to the needs of a school or college. In chapels and auditoriums the inspirational value of fine architecture has perhaps its greatest effect. Such buildings are of a more monumental nature, and in their design the architect is not so rigidly bound by the requirements of utility. In this chapter we find illustrated such noted examples as the Hamilton College Chapel, built in 1828 from a design by Philip Hooker, the chapel at West Point by Cram, Goodhue & Ferguson, and many other beautiful structures. The widely varied types of buildings which go to furnish living and recreational facilities are discussed and illustrated in the several chapters which follow, and include dormitories separated under two headings,—those for men and those for women; dining halls and cafeterias; engineering and central heating plants; art buildings and museums; and structures such as gymnasiums for athletics as well as buildings devoted to all forms of student and faculty welfare.



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Of great practical value to the architect about to engage on a commission involving college buildings will be the two final chapters, one on "Sundry Important Considerations," and the other dealing with actual "Building Operations." A complete college plant combines in itself so many diversified functions that the study of their planning covers an extremely broad field of architectural knowledge of which the present carefully prepared volume is a very complete and well considered digest.

COLLEGE ARCHITECTURE IN AMERICA. By Charles Z. Klauder and Herbert C. Wise. 301 pp. 7½ x 10 ins. Price $5. Special net. Charles Scribner's Sons, 597 Fifth Ave., New York.

THE STEEL SQUARE POCKET BOOK. By Dwight L. Stoddard. 181 pp. 3¾ x 5¾ ins. Price $1. Scientific Book Corporation, 15 East 26th Street, New York.

THE issuing of a manual in a fourth edition should certainly be convincing proof of its value to those for whom it was prepared. Mr. Stoddard says, to quote the preface to this edition: "More than 30 years ago, to answer a correspondent, I wrote a short article on the square for *Carpentry and Building,* now *The Building Age.* Since then I have been asked to write articles on the subject, and many have been printed by magazines.

"Carpenters then requested me to put these articles into book form, but as so much had been written on the subject, I doubted the need for a new book. However, I found that little was available in plain and practical language, with illustrations to suit, for the carpenter and mechanic. It is 24 years since the first edition of this work appeared. The demand has been so satisfactory that three revisions and enlargements were justified. The original idea, that of a convenient and handy reference on the use of the square, has been adhered to throughout. It is not possible in this small book to tell of all of the possibilities of the square, but a great deal will be found on the use of this tool or calculating appliance which answers almost at once nearly every problem that comes before the practical carpenter.

"An important feature of the illustrations is the absence of reference letters. Instead, an exact engraving is given of the square itself laid on the work and showing all points, lengths, and quantities sought. This eliminates the reading of long descriptions, because in many cases the illustration shows the solution of the problem. This feature should commend itself to all carpenters.

"The numbers that appear at the beginning of the paragraphs throughout the book indicate the number of the problem of which the paragraph treats and corresponds with the illustration bearing the same number."

In this edition the Steel Square Pocket Book appears in a new garb,—"revised, enlarged and entirely reset."

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THE improvement which has accompanied the progress of American architecture during recent years has been no more marked in any department than in that of an ecclesiastical nature. This has been due primarily to the rise of a few architects who by travel and study have acquired much of the point of view from which worked the builders of the beautiful structures which during the fourteenth century and the fifteenth were being built over all of Europe.

These architects have closely studied the churches, chapels, convents and other similar buildings in England, France, Spain and elsewhere, and the result has been a number of American churches of an excellence so marked that they have influenced ecclesiastical architecture in general and have led a distinct advance toward a vastly better standard. This improvement has not been exclusively in the matter of design, for plans of older buildings have been adapted to present-day needs, and old forms have been applied to purposes which are wholly new.

THE appearance of a new and revised edition of a work which is by far the best in its field records this progress. Mr. Cram, being perhaps the leader among the architects who have led this advance, is himself the one individual best qualified to write regarding the betterment of ecclesiastical architecture. The editions of this work of 1900 and 1914, which have for some time been out of print, have now been considerably revised and much entirely new matter has been added, which in view of the change which has come over ecclesiastical building of every nature is both significant and helpful.

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THE EDITOR'S FORUM

A DISTINCTIVE AMERICAN ARCHITECTURE

CHICAGO'S towers and Manhattan's cliffs of masonry are the forerunners of a distinctive American architecture, Louis La Beaume of St. Louis, a director of the American Institute of Architects, declares. America has completed that period of its history when it was not only a melting pot for many races but a museum of the architecture of many lands. Mr. La Beaume predicts that our architects will lay aside historical patterns for buildings and will develop a style of architecture corresponding to the swift tempo of our existence.

"If many races have been fused in the making of America, the architecture of many races has been transplanted, if not fused, to safeguard the American citizen against homesickness for the scenes of his ancestors. Greece, Rome, the Italy of the Medicis, the France of every dynasty from Charlemagne to Poincaire, the England of 800 years from William the Conqueror to George V, the Spain of the Moors, of Ferdinand and Isabella, and the four Philips, have been copied. A diligent student may make the equivalent of the grand tour of Europe and familiarize himself with the culture of a dozen races throughout a period 2,000 years without a passport,—without even a twinge of seasickness. This is the architecture of America, but what of American architecture? What do our flattering critics mean when they proclaim that we lead the world in this most vital of all the arts? Do they mean that our Georgian houses are better than Georgian houses ever were, that our Normandy manors are more redolent of Normandy, our Cotswold cottages more utterly charming, or our Spanish farmhouses more typically Spanish than their prototypes? No, they cannot mean this. They must mean something else. Our Gothic churches cannot be better than the Gothic of the Ile de France, our temples, or rather our templed memorials, or counting houses, cannot exceed the perfection of the Parthenon. They must see in our factories, in our skyscrapers, something they have never seen before; something must have suffered a sea change.

"We know that vastness and bulk, volume and height are attributes to conjure with. We know that those things cause the beholder to draw his breath,—almost make his reason totter. We have had some practice in managing them, which less prosperous, less dauntless people have not enjoyed. And yet in the very handling of these American masses are we not still straining our eyes toward Europe for suggestion? We talk now of modernism, we speak with disdain of the past of yesterday, and there is health in this, but let us be humble for a while, until we can be quite sure that the modernism we strive for is inherent in our own character. To borrow it from Sweden, from Germany, from Holland or from France would be but to continue our incorrigible habits of plagiarism. As moderns, we need offer no apology for being modern. It may be our misfortune, but it can hardly be said to be our fault. We were born too late to be anything else, and it is really to our credit that we are more willing each day to admit the dreadful fact. We share our modernism, too, with our contemporaries the world over. If our old stodgy habits are changing, if we are beginning to detect a new crispness and terseness, a new simplicity and directness in the design of our small as well as of our large buildings, we may seek for the cause in two factors. First, we are living in a crisper, speedier, smarter time; and, second, client and architect are more nearly one and the same than they ever were before.

"The young architect of today feels and reflects the tempo of his generation. As in dress, for instance, and feminine dress particularly, yards and yards of hampering fabric which an outworn tradition had sanctified, have been stripped off; as manners and music, and even morals, are tending more to the point each decade,—each year almost,—so our architecture is stripping itself of much of the historic impedimenta which clog and hamper its natural purpose. Climate and war and the worship of God, trade and the lust of gold, the struggle for power, the struggle for liberty, and fire, these things have all affected the architectural panorama. Which, most of all, it is difficult to say. The mediævalists might say the love of God; the classicists the love of liberty. War opened the path of the Renaissance into France; the great fire of London cleared the way for it in England. The love of gold, and again the love of liberty, lured men across the ocean. Perhaps in some cities of the United States fire has done more for civilization and architecture than any other single force. Fire can of course be a great blessing.

"Architecture is an art which, above all others, is founded on realism, on sincerity. Our past history might indicate that we have been rather flippant in our attitude toward it. Art is something more than the feather in an Alpine hat or the gold braid of an admiral's sleeve. If we are to regard modernism as just another fashion to be played with, as something that is going to be the rage like all the other rages, we will continue to be fashion mongers rather than architects, false to our opportunities and our obligations. As a plagiarist with a bad conscience but at the same time with an earnest desire to reform, I would say that the American architect should have full faith in the essential virtues of the American character, and that he should 'be himself.'"

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FLOOD IN BANK

....rips linoleum from floor tears veneer from table....

TELESCO PARTITION PRACTICALLY UNSCATHED

A FEW weeks ago, on a Sunday, a bursting water main precipitated tons of water into the Director's Room in the Bank of Yorktown, New York City. For practically an entire day the room stood in 2 feet of water. After the water was pumped out, here is what they found:

1. *The linoleum had been ripped clear off the floor and had been floating in the room.*

2. *On the expensive Director's Table in the center of the room, the veneer had been torn away.*

3. *On a coupon booth just outside the room, the finish of the wood was utterly ruined.*

With such havoc around it, you would expect the partition to be a total loss. You might expect it to collapse from the water pressure. Certainly its finish must be destroyed. But as a matter of fact the partition was practically unscathed. For it was Telesco Partition. Its beautiful walnut finish was unharmed, thanks to the exclusive lacquer used. The partition was as rigid as ever except at one point where shelves of stationery stored behind it came tumbling down against it! "We were amazed," writes Mr. J. O'Brien, vice-president of the bank, "at the remarkably fine appearance of the Telesco Partition in contrast to the other equipment in the room!"

Put Telesco under any test... for durability of finish, for ease of erection, for movability, for *real* economy... and its practicability will amaze you; just as its beauty, in luxurious American Walnut or African Mahogany, will impress the most exacting tenants.

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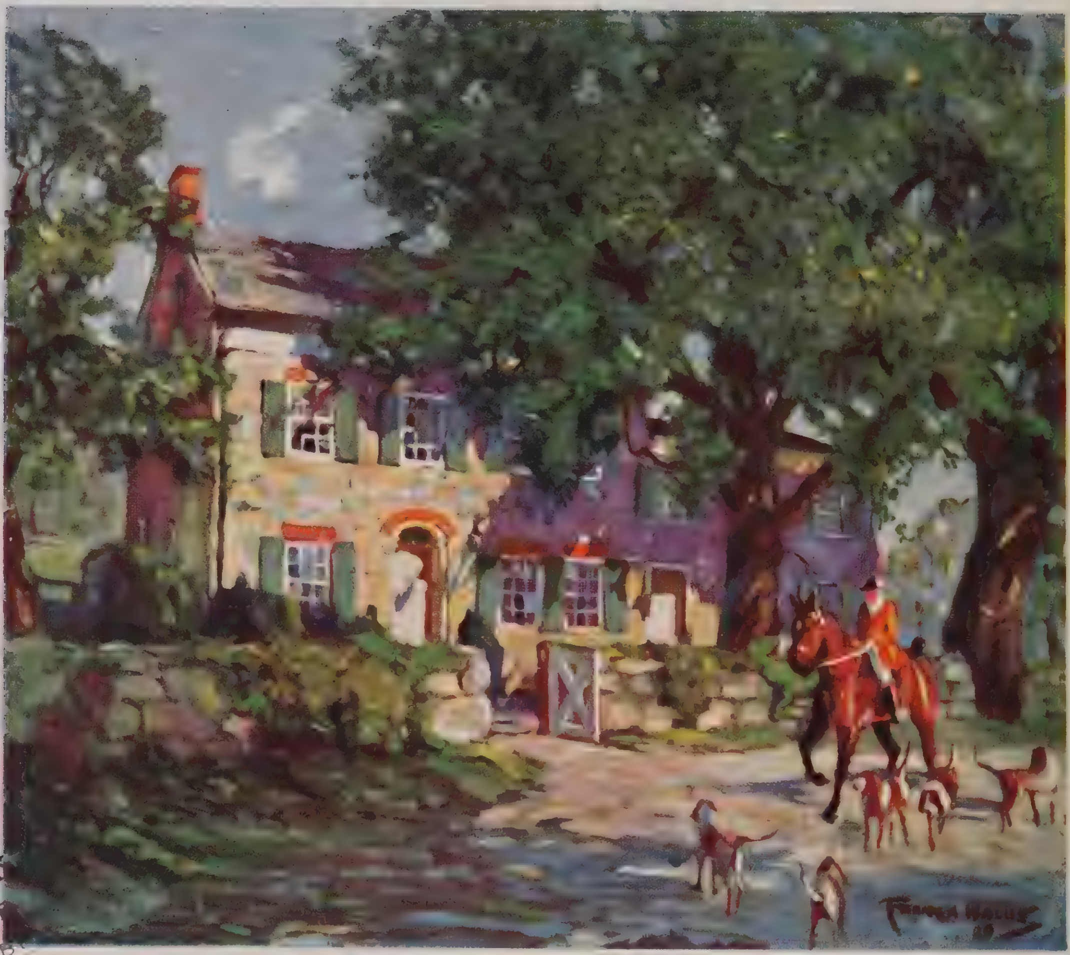
AFTER THE FLOOD
{Photos shown were not retouched}
Above: Telesco Partition, unharmed.
At left: Leg of Director's Table, showing how veneer had been ripped away.

An Invitation

Just off Fifth Avenue, at 40-46 West 23rd St., Henry Klein & Co., Inc. has opened a huge store. Here you will find beautiful examples of paneled rooms for office and home... as well as model offices displaying the use of various types of Telesco Partition. We invite you to come in ... for it is a veritable architectural exposition of craftsmanship in wood.



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"BLOCK HOUSE." STANWICH, CONN.

From an Oil Sketch by Frank A. Wallis

THE
ARCHITECTURAL
FORUM
VOLUME LI NUMBER TWO
AUGUST 1929

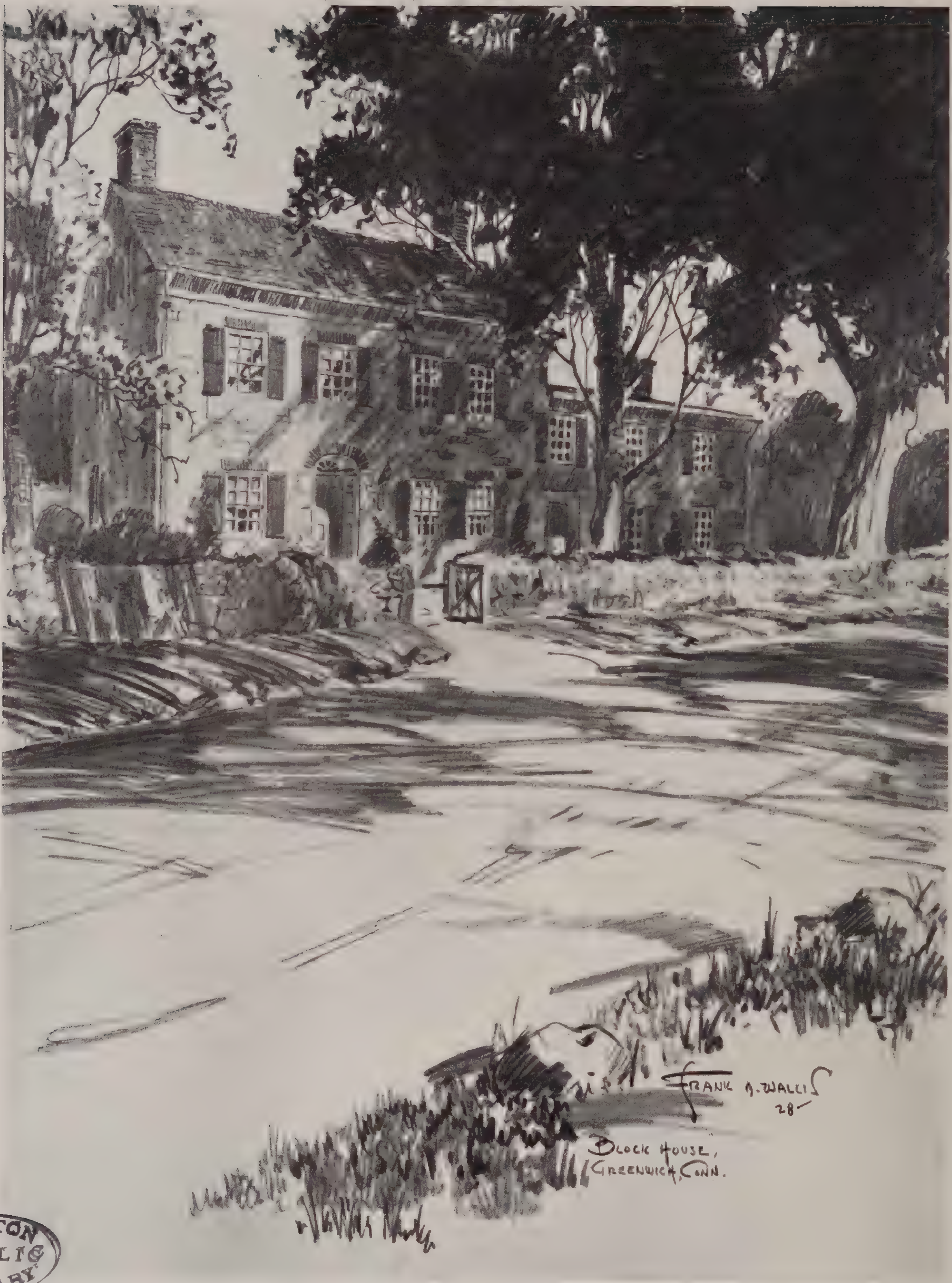
THE "BLOCK HOUSE," STANWICH, CONN.

TEXT BY
STEPHEN HAWEIS
DRAWINGS BY
FRANK A. WALLIS

A CERTAIN woman was once talking to the Chinese ambassador at a distinguished gathering in Washington. "My passion," said she, "is American antiques. I collect them." And a slow, irrepressible smile overspread the face of the oriental diplomat. To one who habitually thinks of antiquity in terms of thousands of years, the very phrase, "American antiques" seems to be a contradiction in terms,—almost an "Irish bull." But we have a few things, already as obsolete as the astrolabe, which are both historic and antique. There are certain things and places which should never be forgotten and which should be most carefully preserved. Every memento of Washington and Lincoln is eagerly sought for. Tom Paine's house at New Rochelle, the old train in the Grand Central Station, and a host of other historical remains are already under watchful care. It is to he hoped that Robert Fulton's steamboat at Kingston will be rescued from decay before it falls to pieces. But if there is one thing of more interest than another to the millions who now find their chief joys in the possession of automobiles, it should be,—one would think,—the birthplace of the first American-made machine.

In 1858, one Simon Ingersoll, cousin of the great American freethinker, constructed a steam car at his home in the parish of Stanwich, near Greenwich, Conn., and drove it proudly into Stamford, a distance of about eight miles. The horrified sheriff of that day arrested his progress there and would, no doubt, have arrested Simon, too, if anybody else had known how to drive his infernal machine. As it was, there was nothing to do but order him to take it off the road as quickly as might be, on the score of its being a public menace,—probably a very just suspicion. Simon Ingersoll performed a right-about turn and drove the car home without accident. It did 16 miles over poor roads in safety,—that alone should not escape the recording stylus of Clio, the muse of history. The machine was then scrapped, and the inventor turned his hand to other things. Simon Ingersoll was not a man of one idea, nor were all his inventions interesting only because they were novel. He was a genius whose labors gave us the Ingersoll rock drill and the Ingersoll thrust bearing, both of which, with very little alteration if any, are in use today. Devices which make holes in rocks, and the details of the intricate machinery which carries us to Europe, are not very conspicuous in everyday life, but most of us are old enough to remember the days when "He had to get under, get out and get under, to fix up his automobile," had an intimate appeal which is almost dead today. Think what the emotions of a man must have been when he made, with his own hands, a car which necessitated no such thing, but was successful from the first.

The birth chamber of the first American motor car is situated about 50 yards behind the old "Block House" of Stanwich. It is a stone ruin now, but some day it will be restored, and it may even become a national monument. Odd that the "Block House" is of stone! It is not of Dutch origin, but a typical English west country house quite unlike the many stone houses of Ulster County, N. Y. New England was not healthy for the Dutch when the "Block House" was built, in 1721. Old country houses of that date are very rare indeed, if this be not the only one left. It was originally almost square in plan, to which a smaller wing was added in the same style about a hundred years later. Simon Ingersoll, who died poor, as is the traditional privilege of most of the world's benefactors, left the house to his widow, who was the last of the Ingersolls to own it. Here is a veritable American antique which should appeal to a variety of American interests,—a stone house in New England, long known and admired by architects, the birthplace of the American motor car, and the ancestral home of the Ingersolls. Both the father and grandfather of Robert G. Ingersoll lived here, so it is probable that Robert spent much of his time here, though he was not born in the house. Lovers of the past will be glad to know that the "Block House" is now the home of Huntington Adams, who has had it admirably



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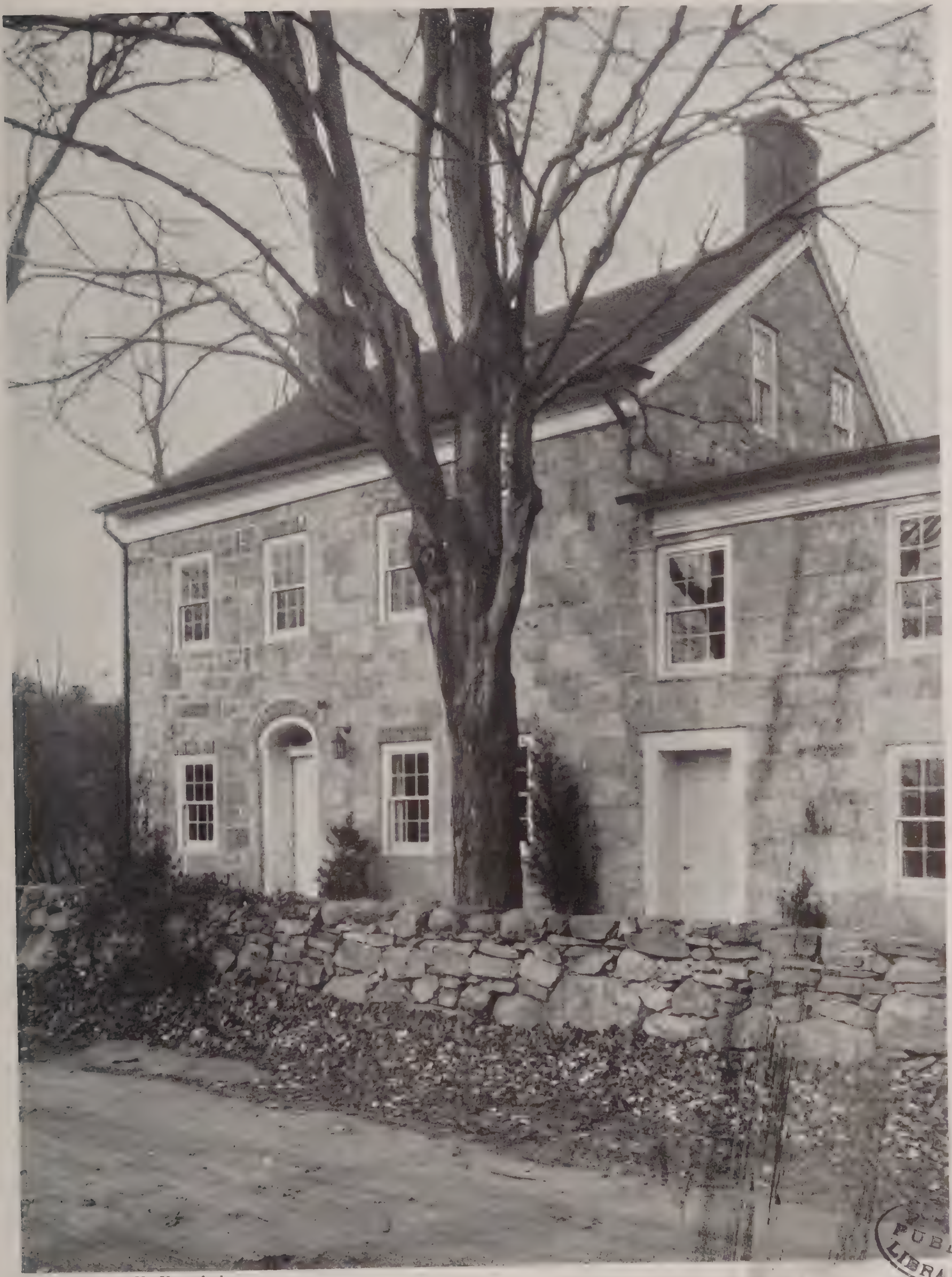

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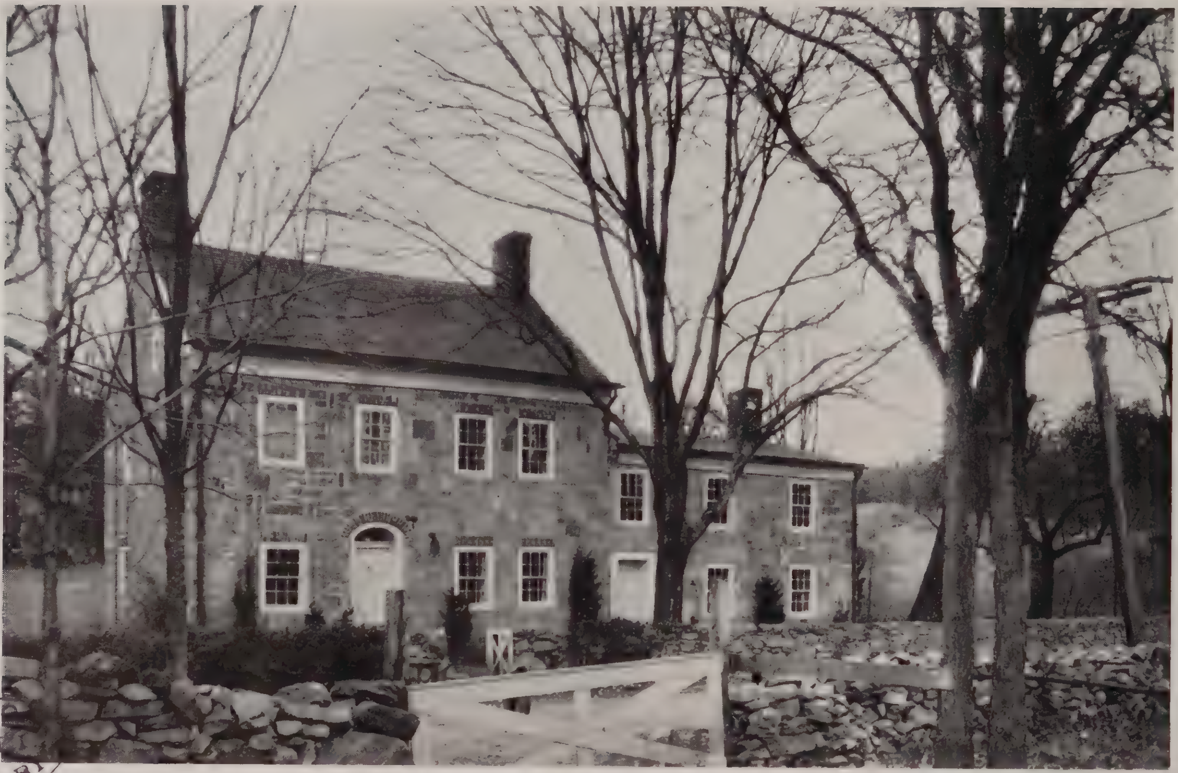

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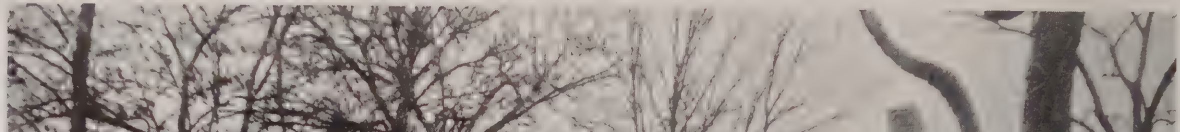

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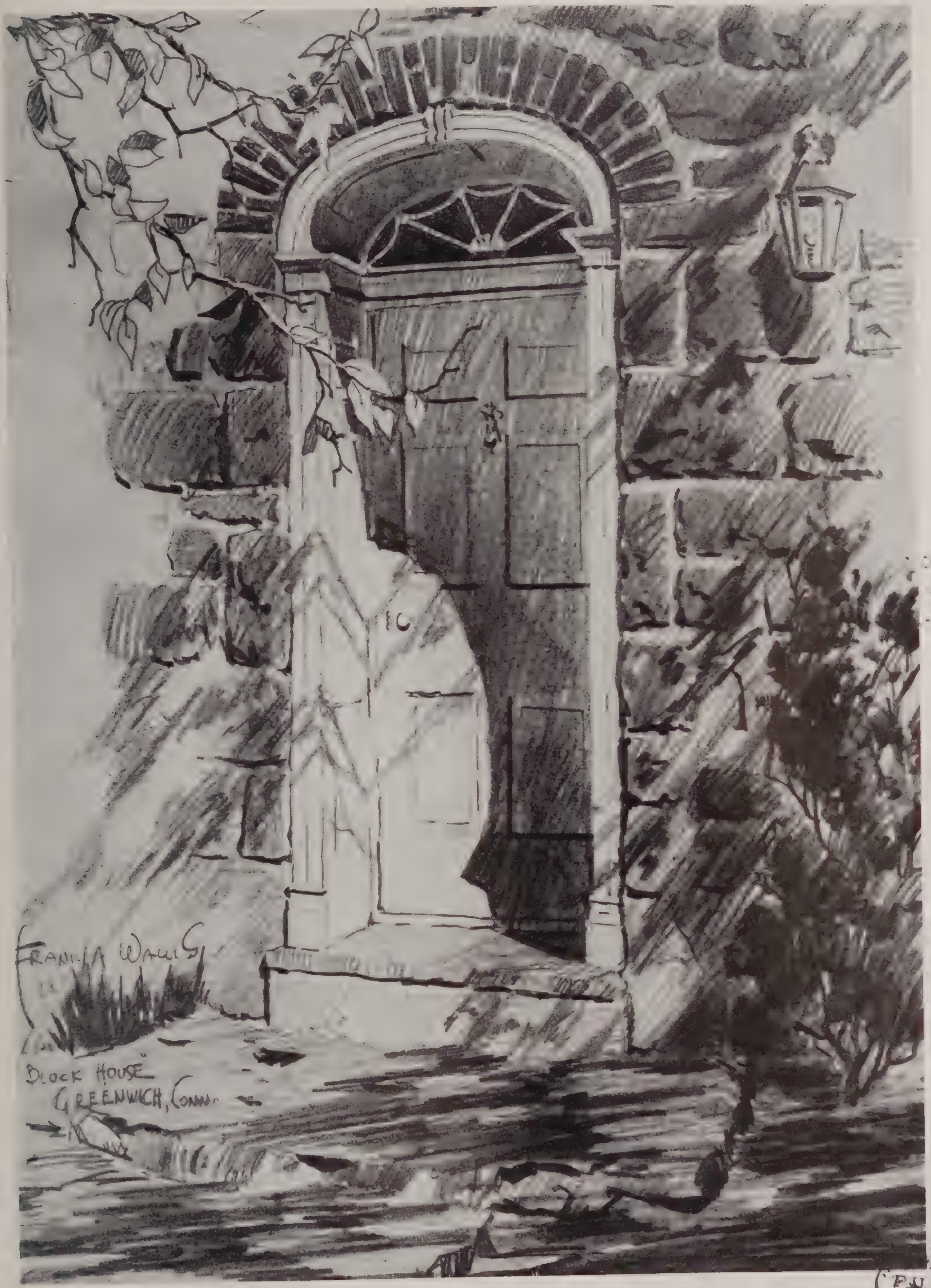

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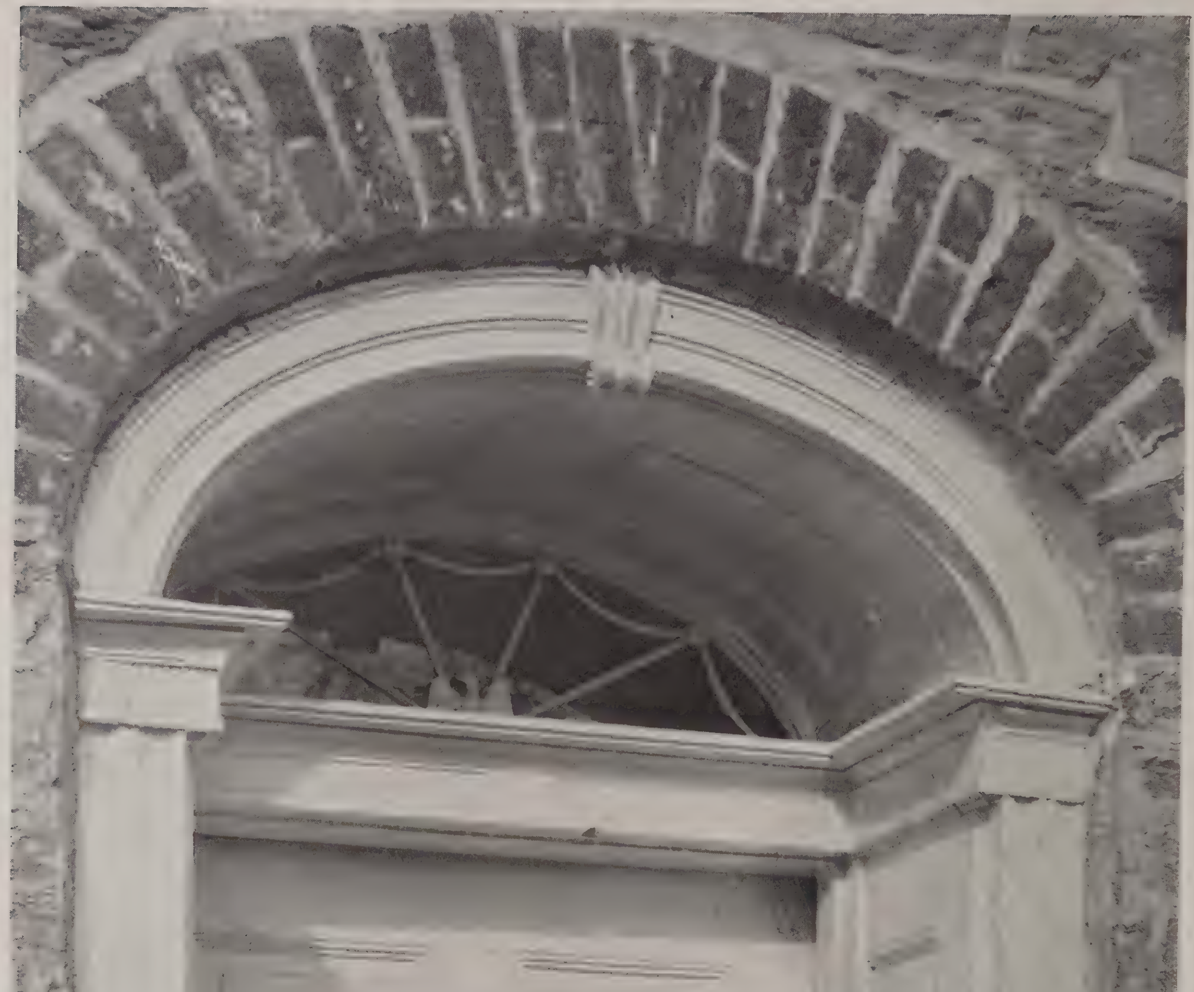

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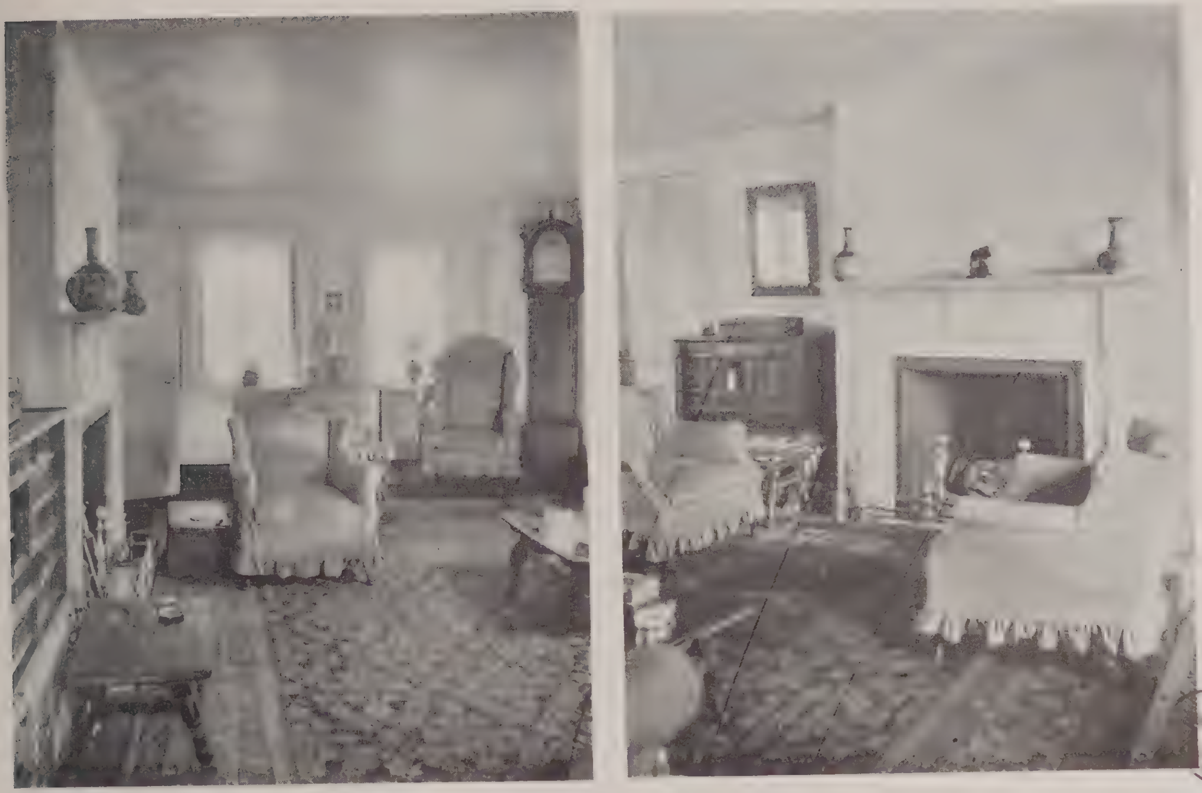

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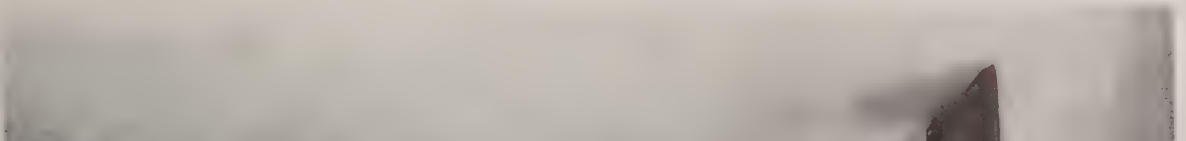

DINING ROOM

"BLOCK HOUSE," RESIDENCE OF HUNTINGTON ADAMS, ESQ., STANWICH, CONN.

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Bedroom

Library

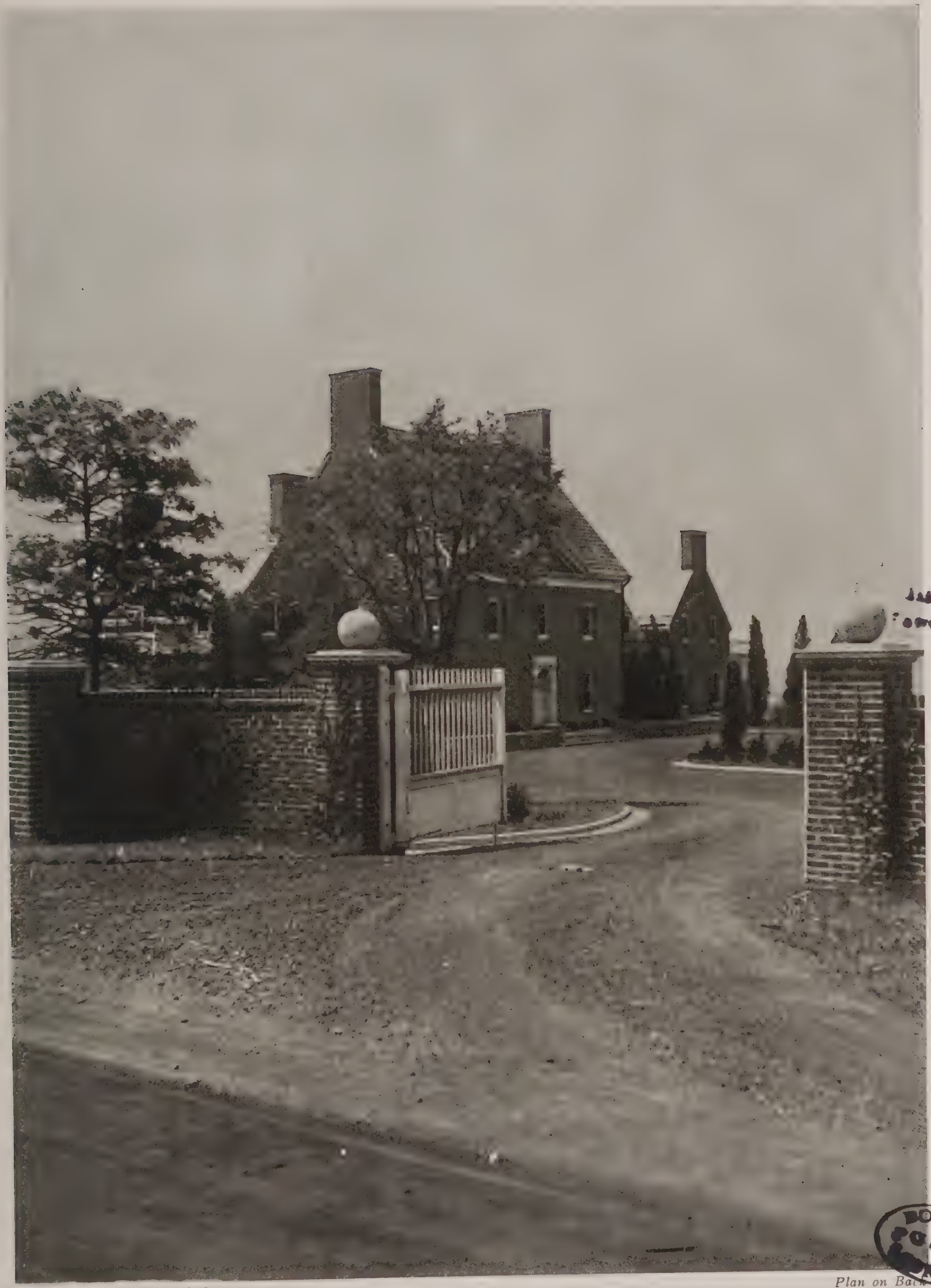
"Block House," Residence of Huntington Adams, Esq., Stanwich, Conn.

restored under the skillful supervision of Parker Morse Hooper, the architect. Shaded by huge trees, of which at least one must be fully as old as the house, it stands close beside the road. Its walls are 20 inches thick, and the plaster, on the inside, where it has not been removed to show the beauty of the hand-faced stone, is applied directly to them. Another curious feature in the building is the brickwork over the windows, curious since there were practically no brick made in this country at that date. The Fraunces Tavern in Broad Street, New York, has similar brick arches, and it may be that the few used in the "Block House" were part of the consignment imported from Swansea for the other building. Brick were made in a factory in the Delaware valley at a very early date, but they must have been rare in Connecticut.

Perhaps these details are of less interest to the average citizen than they are to specialists. More poignant historical associations are not wanting, though particulars may never be found and proved. It is certain that this house was built so strongly to repel the attacks of the Myano Indians who had their forts throughout the wooded hills behind the house. The valley of the Mianus River is still the wildest and least visited section of the country within 50 miles of New York. Women who were our great great grandmothers were hurried to safety within these walls, while great great grandfathers, armed with flintlocks and blunderbusses, stepped warily from the shelter of a rock to that of a covering tree, hoping for a shot at the Indians. There is romance a plenty in American annals which was not recorded by our forefathers because the tragic events of daily life were so common as to cease to be remarkable. If Uncle were late for supper, it was not his club which was the cause of his default, but someone else's club! It was more than likely that the body would be found with a neat circle of skin skillfully removed from the scalp!

Coming down to Revolutionary times,—the days of yesterday by comparison,—the old "Block House" played its part nobly. Half a dozen or more of the defeated soldiery made their way to it after the Battle of White Plains. They could not hide in a conspicuous house by a public road, but the old stone house concealed behind it in the woods, which long afterwards became Simon Ingersoll's workshop, was an ideal retreat. The Ingersoll family kept them hidden and fed them for weeks until it was possible for them to escape.

In imagination I can see an endless procession of cars and trucks, cultivators and business wagons, reverently visiting the first factory and garage, the place from which the great great grandfather of millions of Fords and Packards, Buicks and Cadillacs ran his first Marathon of 16 miles, —a building deserted and broken up in the prime of life, to be utterly forgotten until the year 1924.



Photos. George H. Van Anda

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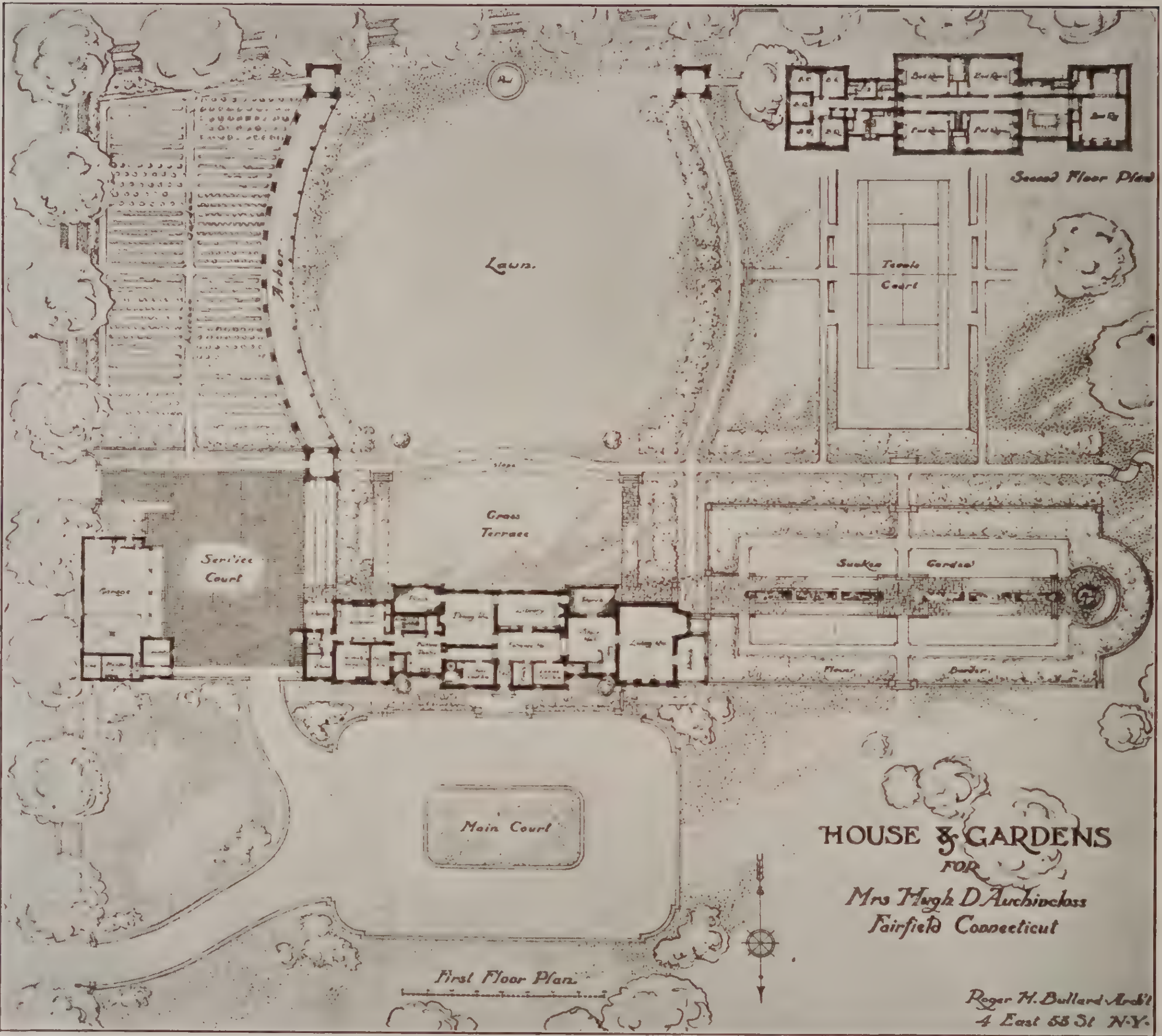

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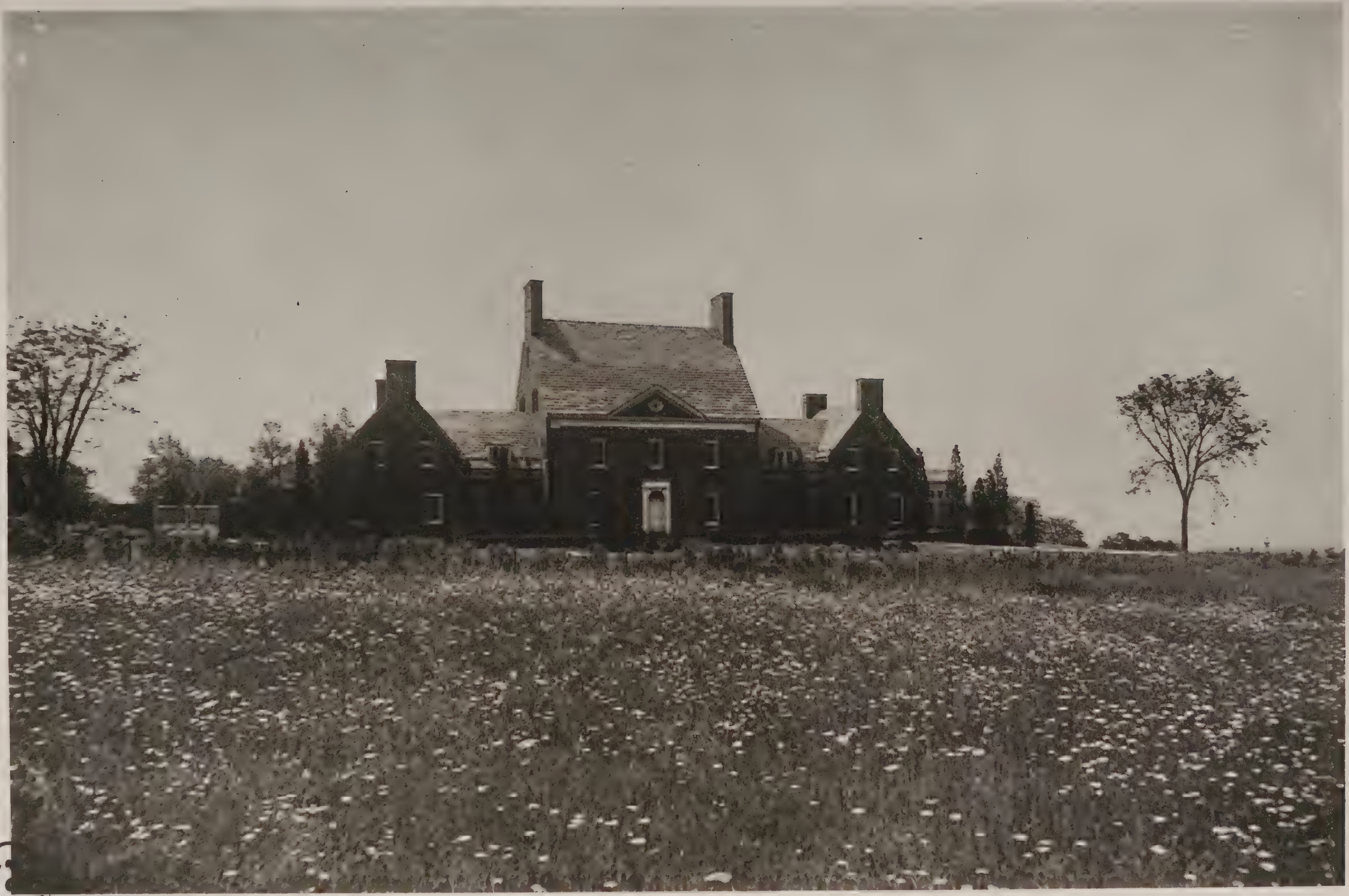

A GENERAL VIEW
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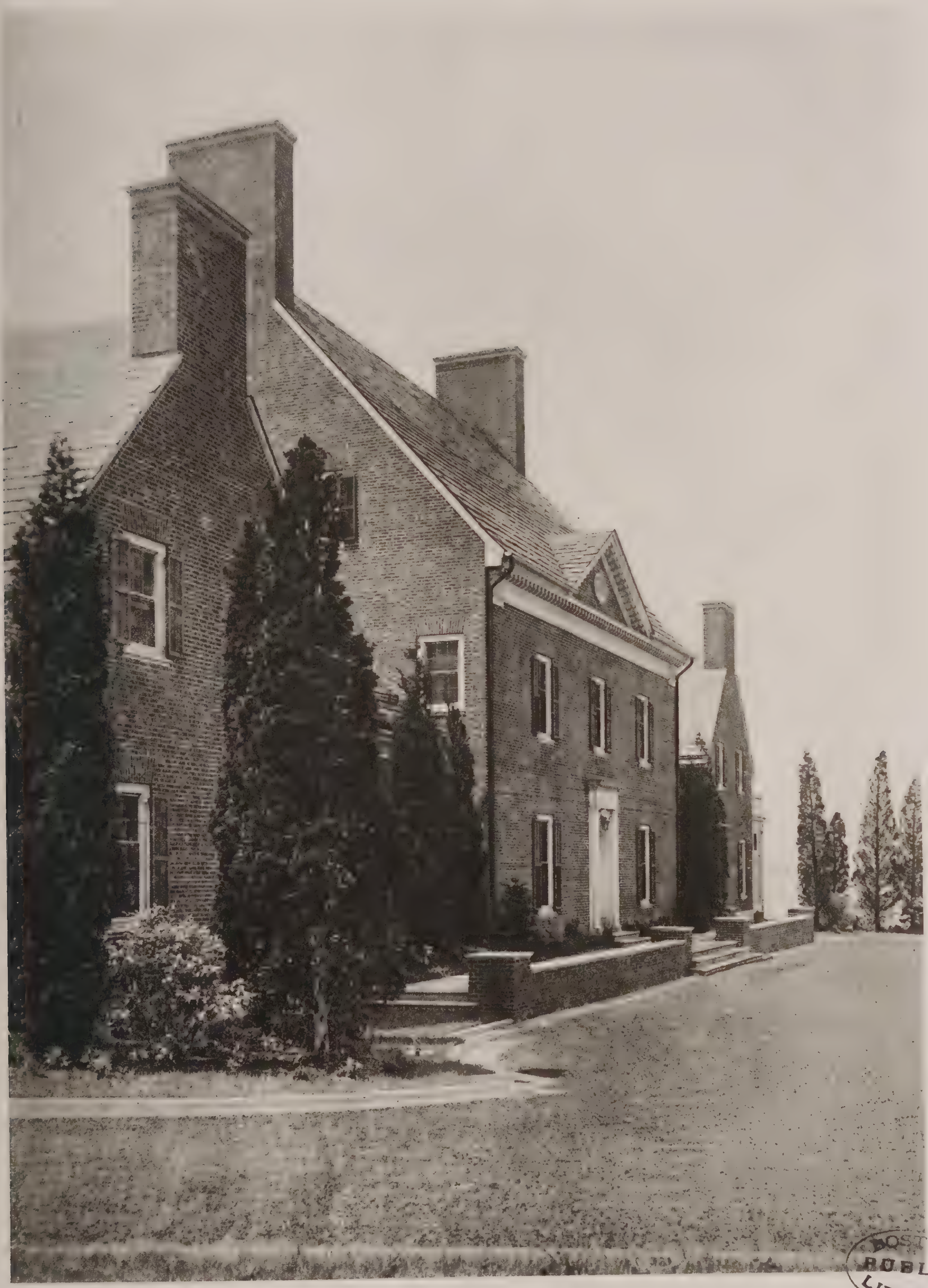

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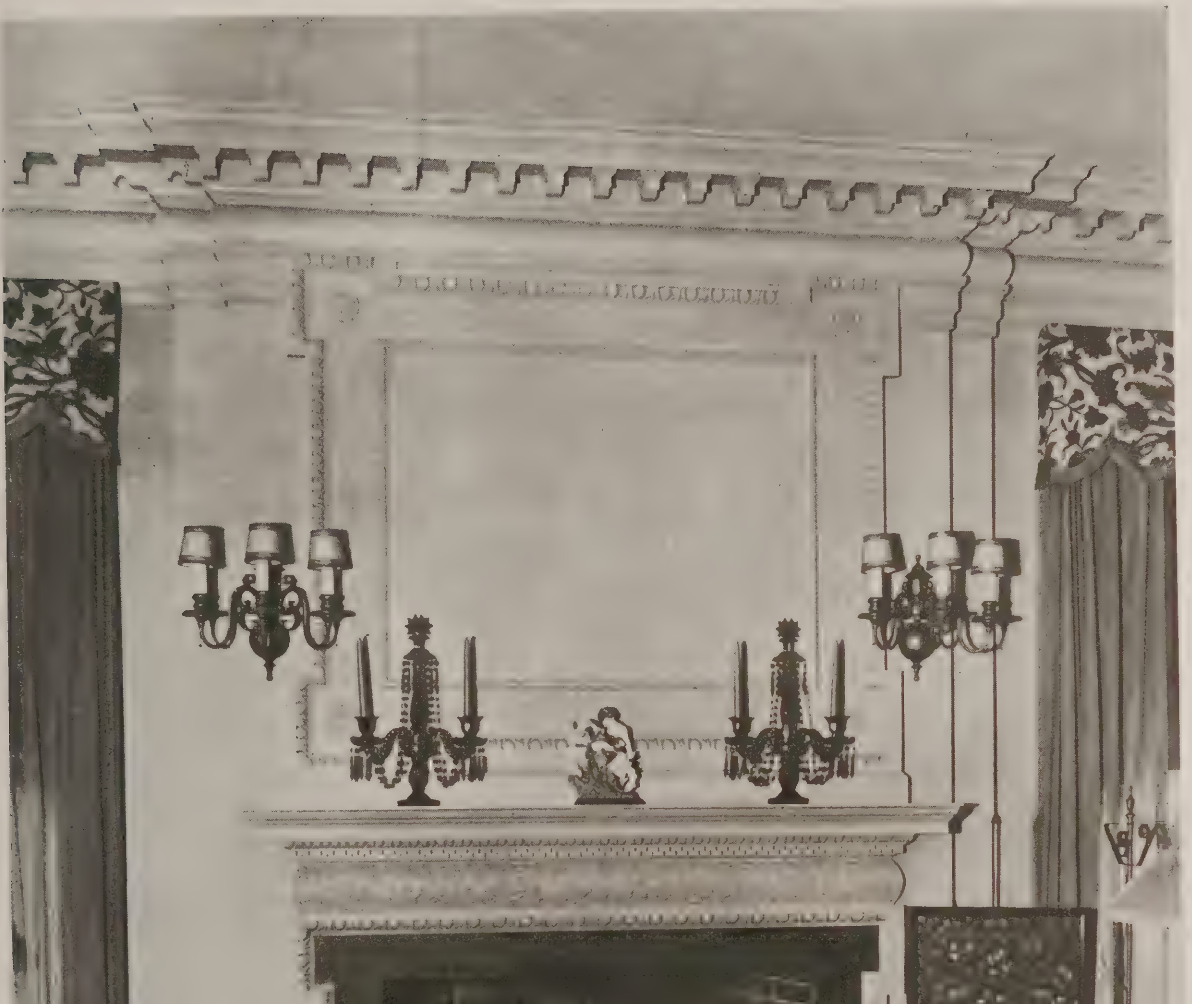

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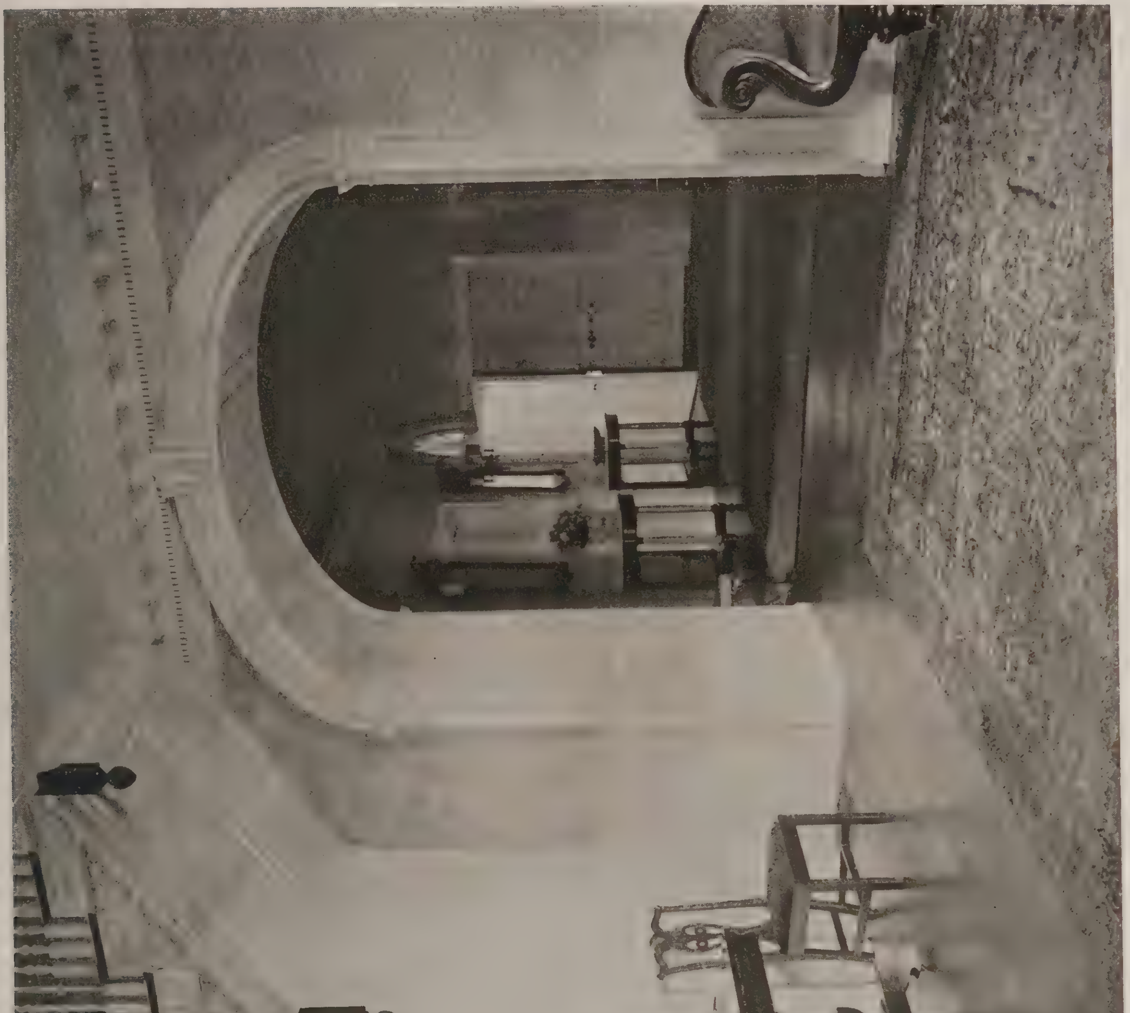

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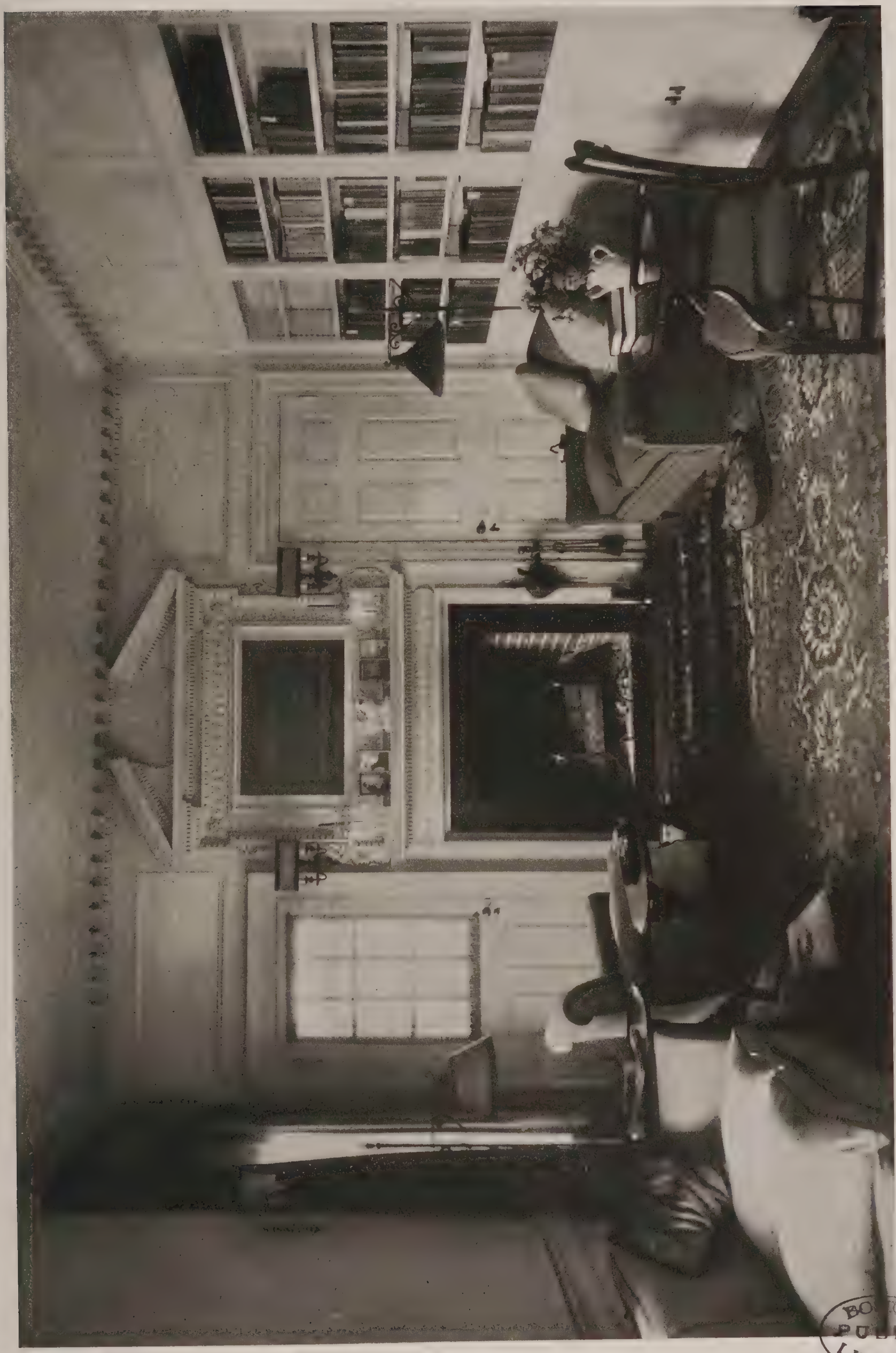

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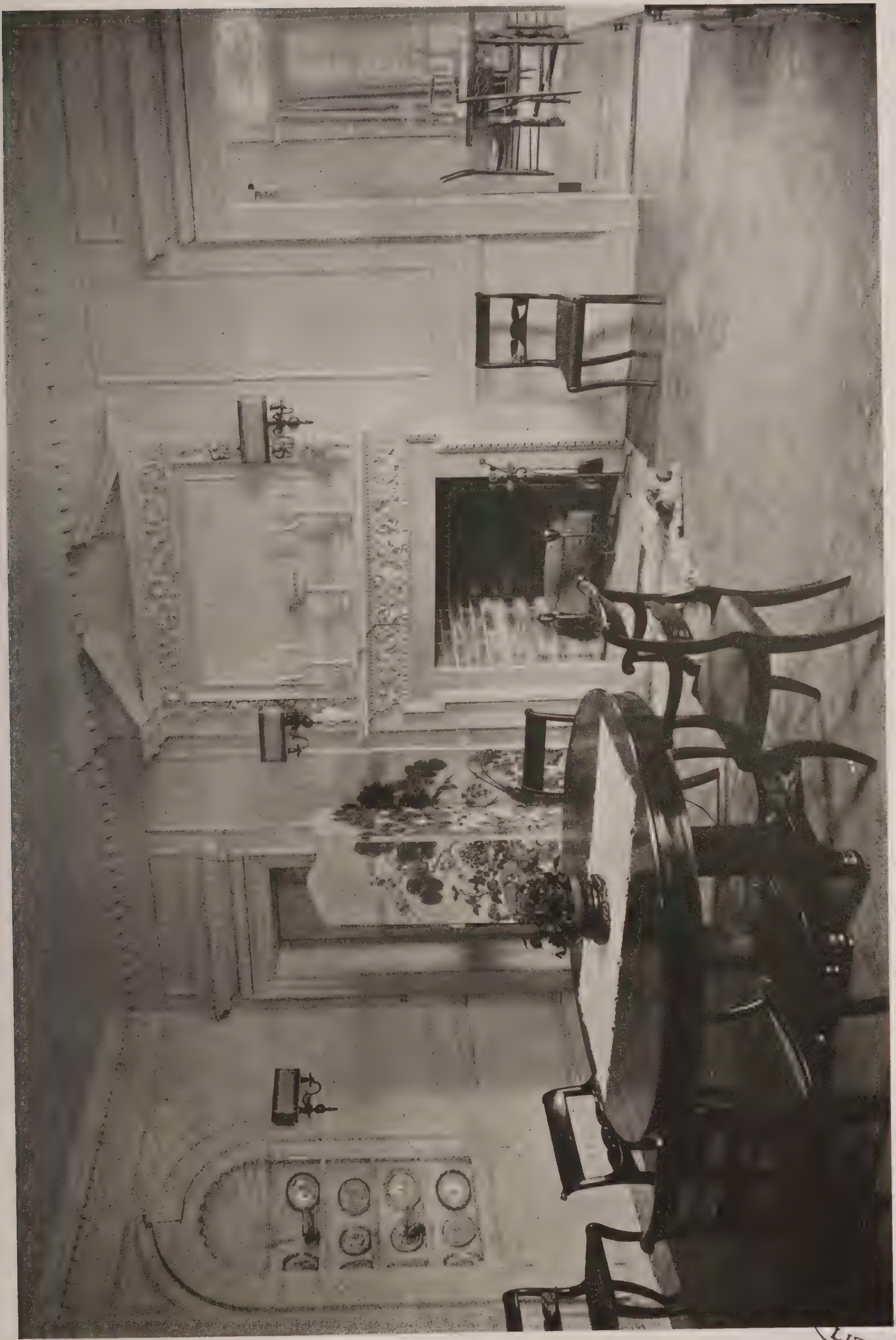

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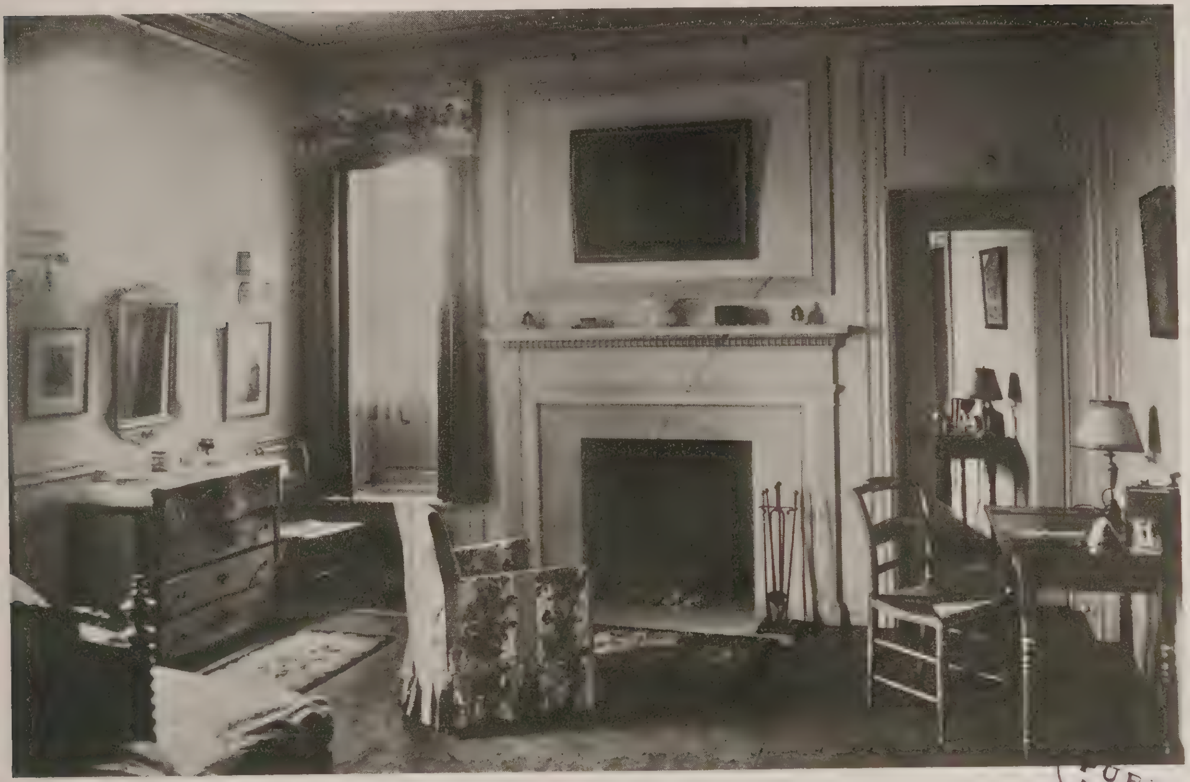

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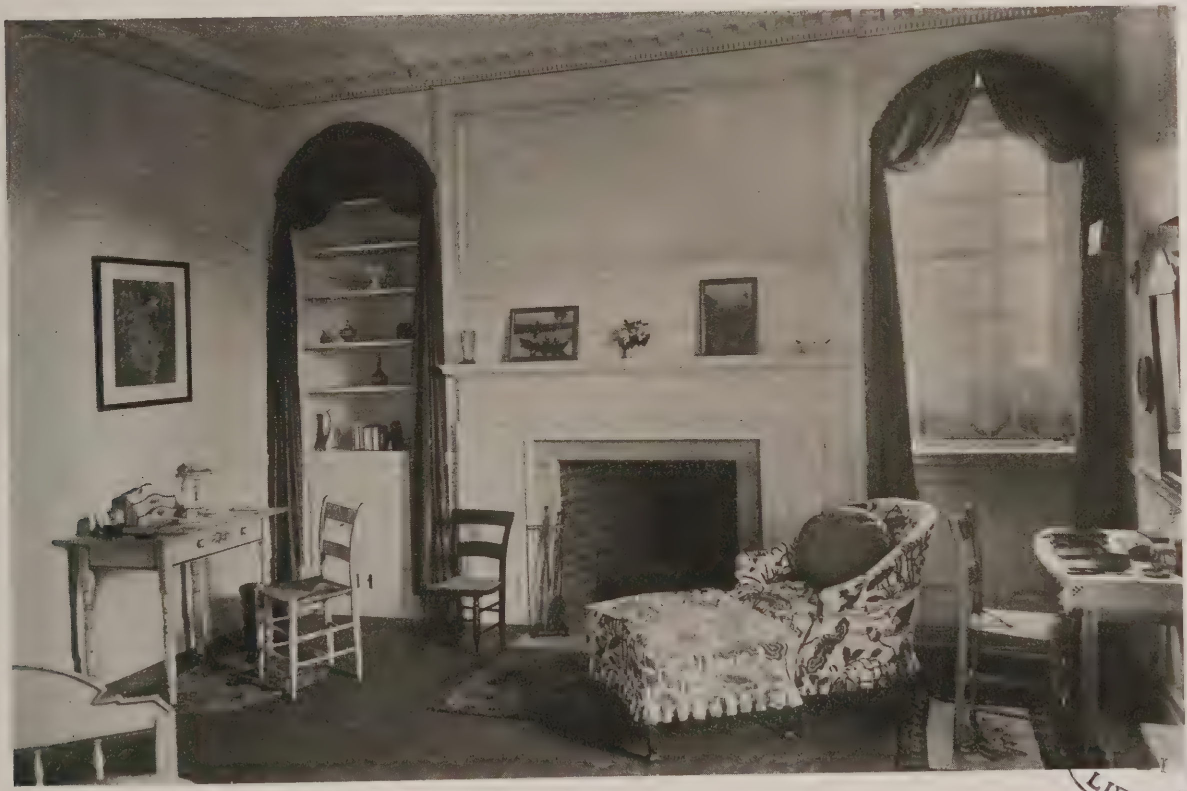

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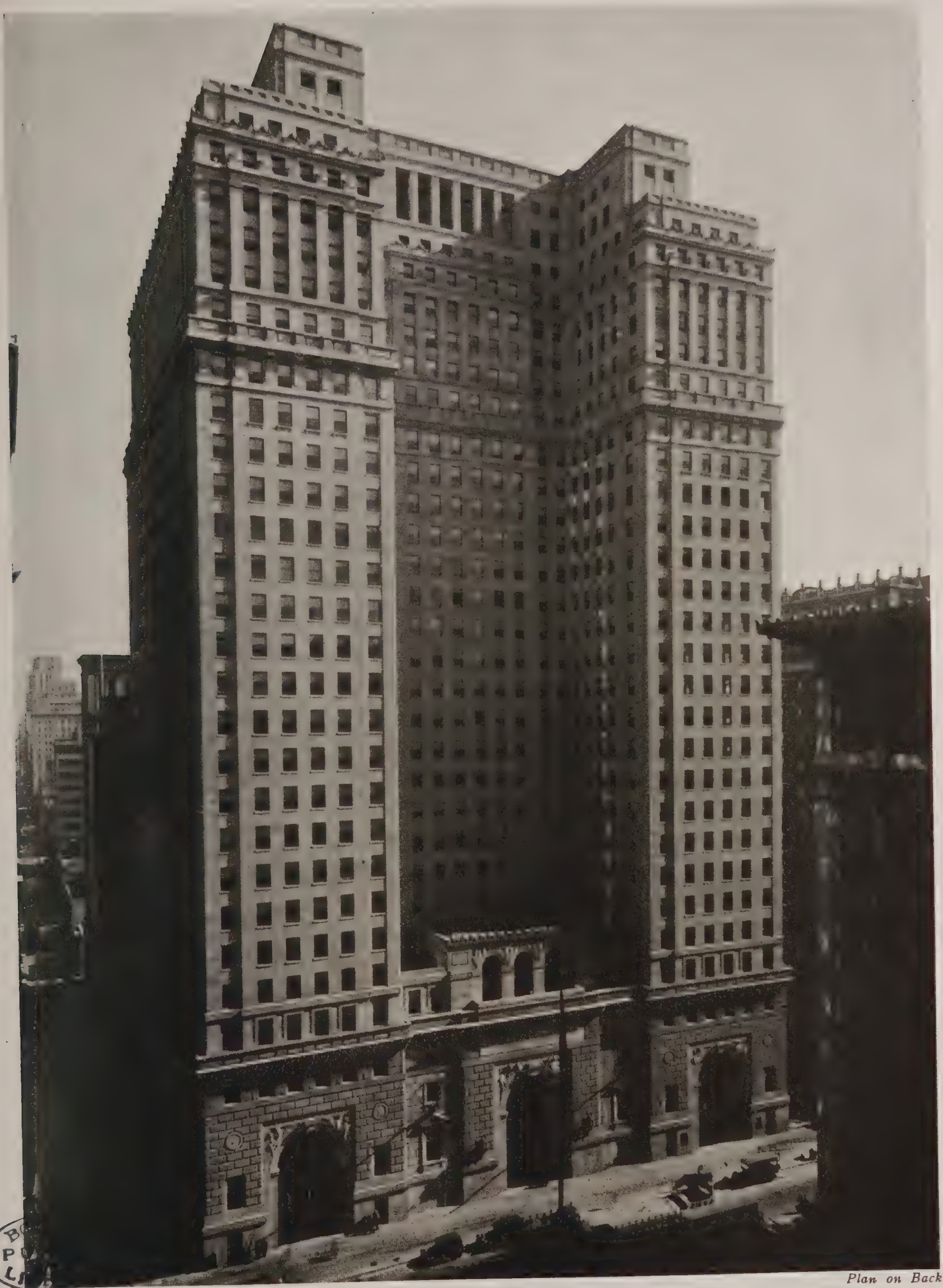

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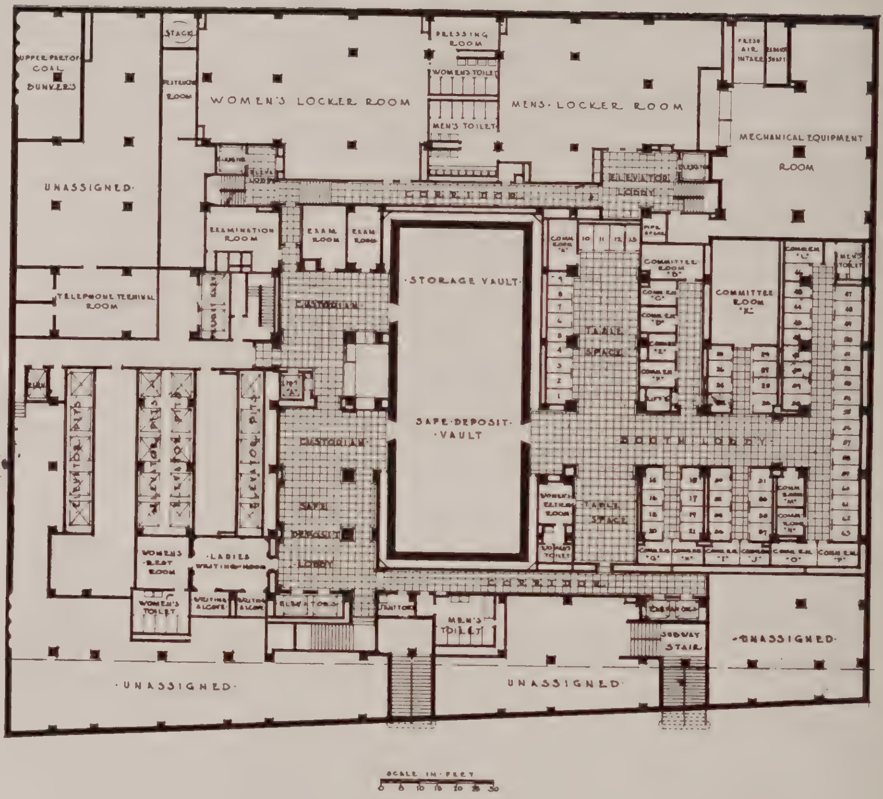

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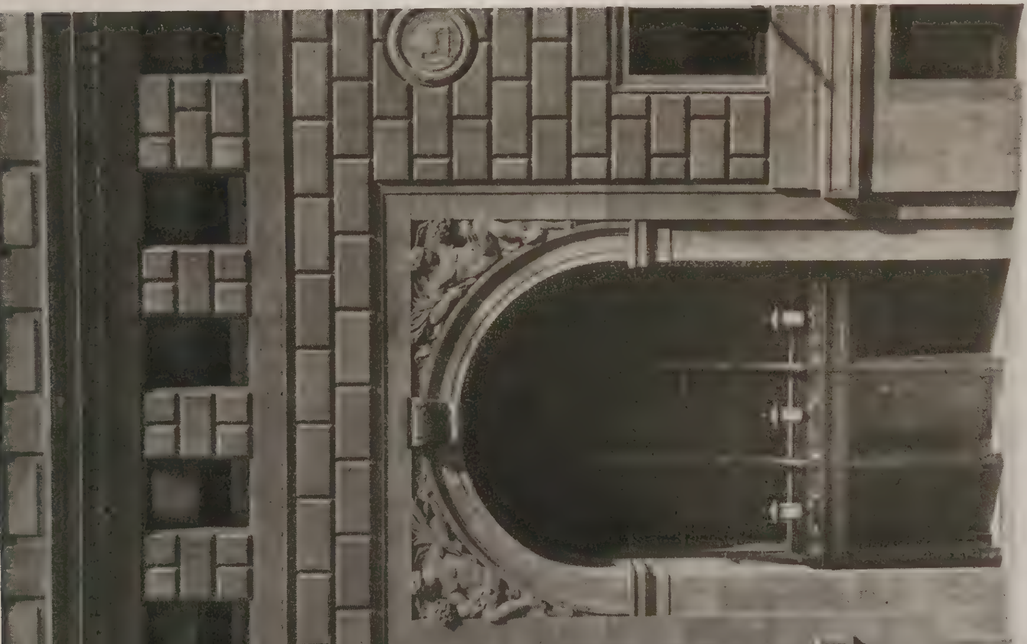

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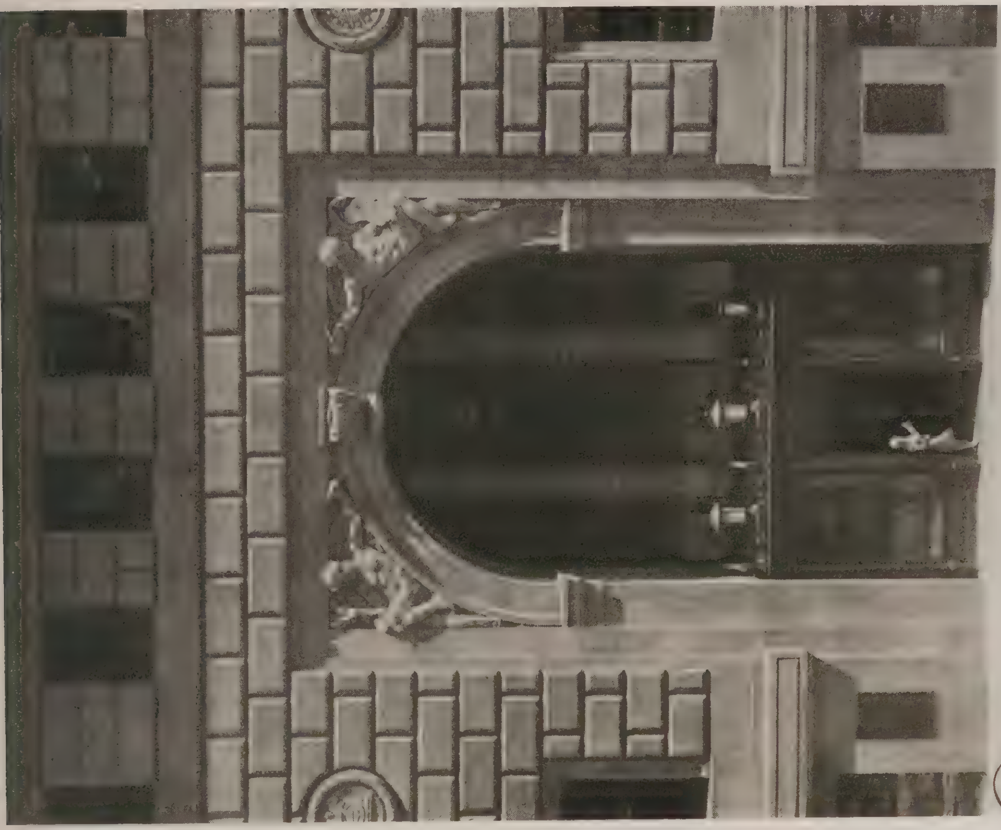

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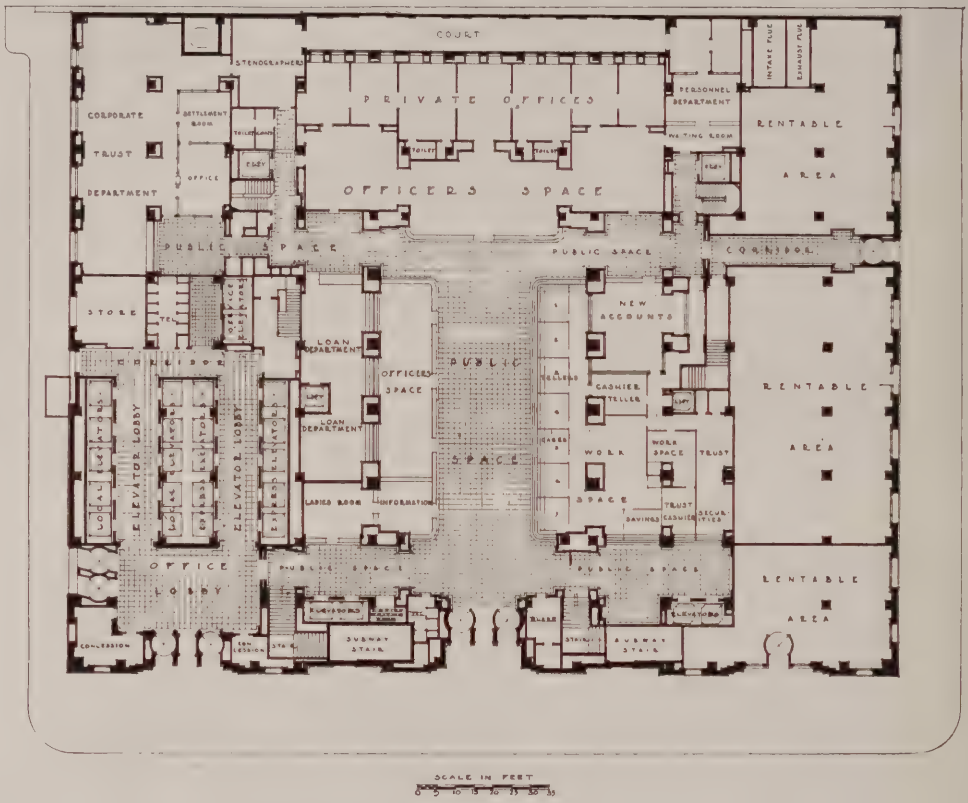

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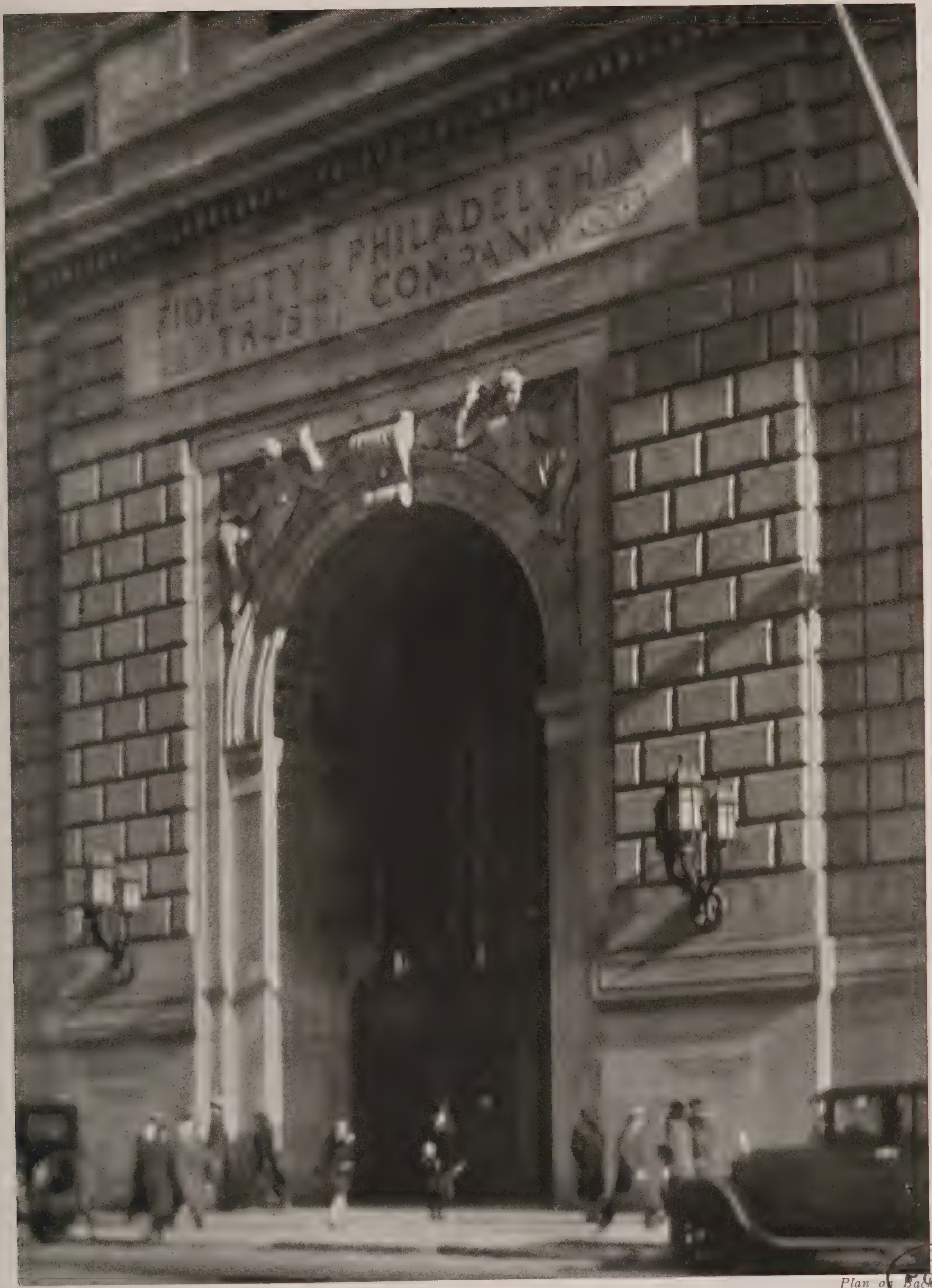

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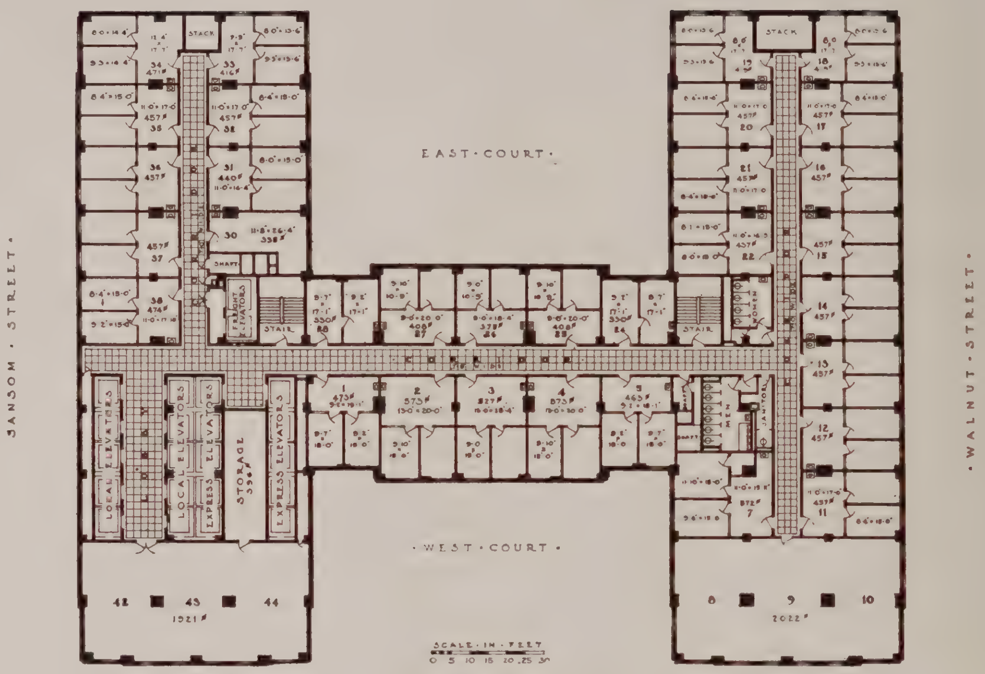

THIRTEENTH FLOOR

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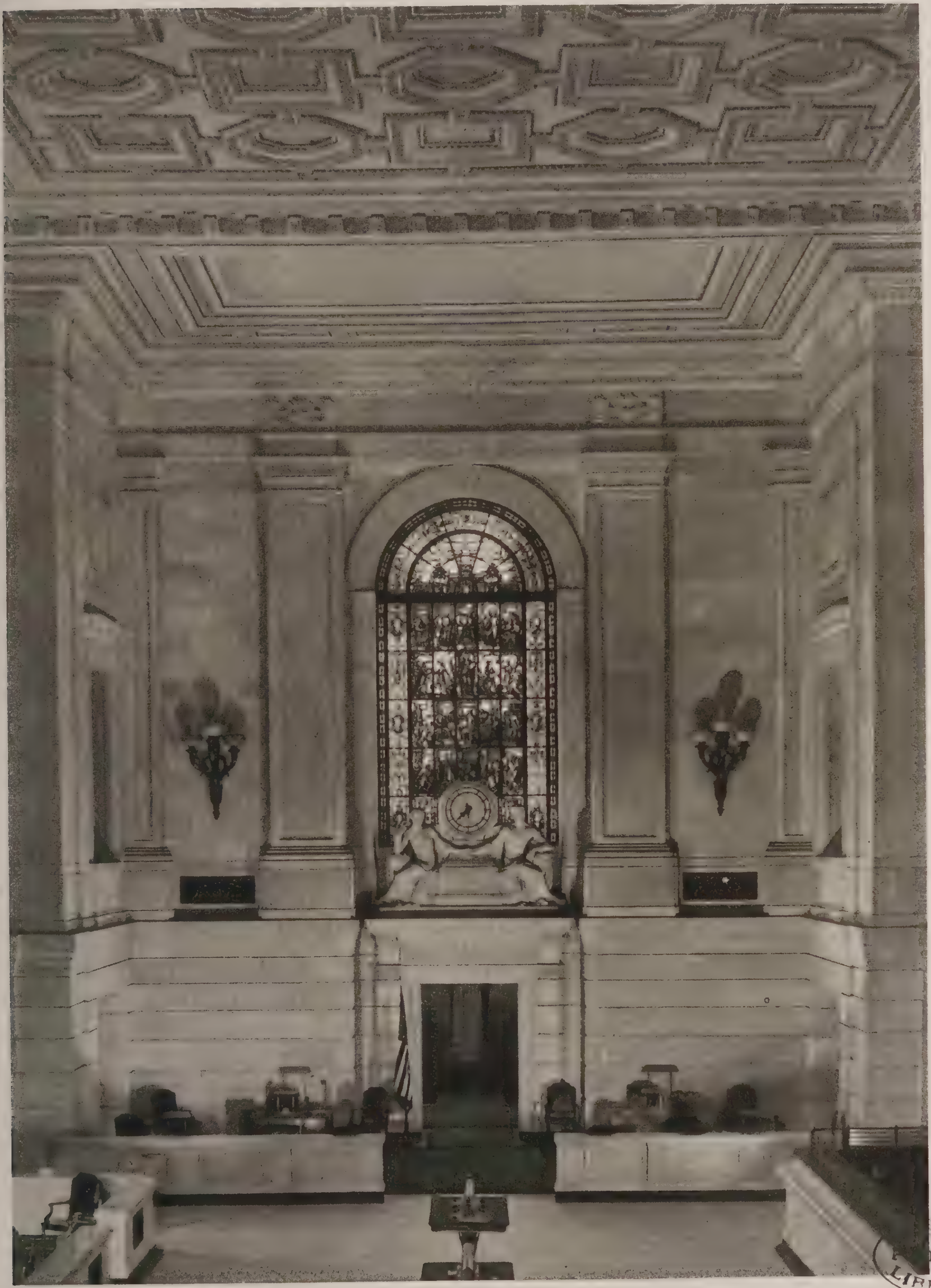

Photos. Rickard T. Dooner

END OF MAIN BANKING ROOM

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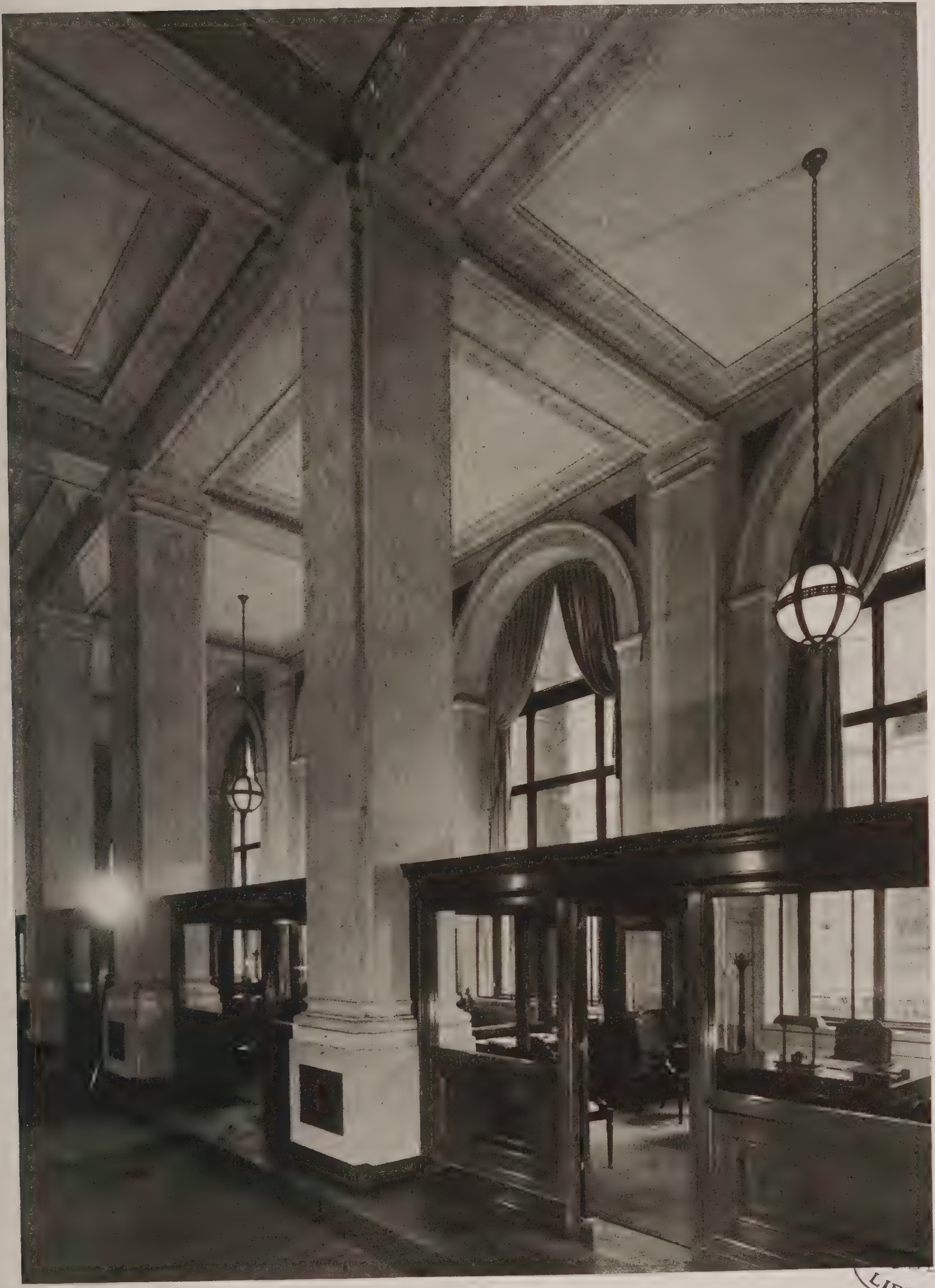

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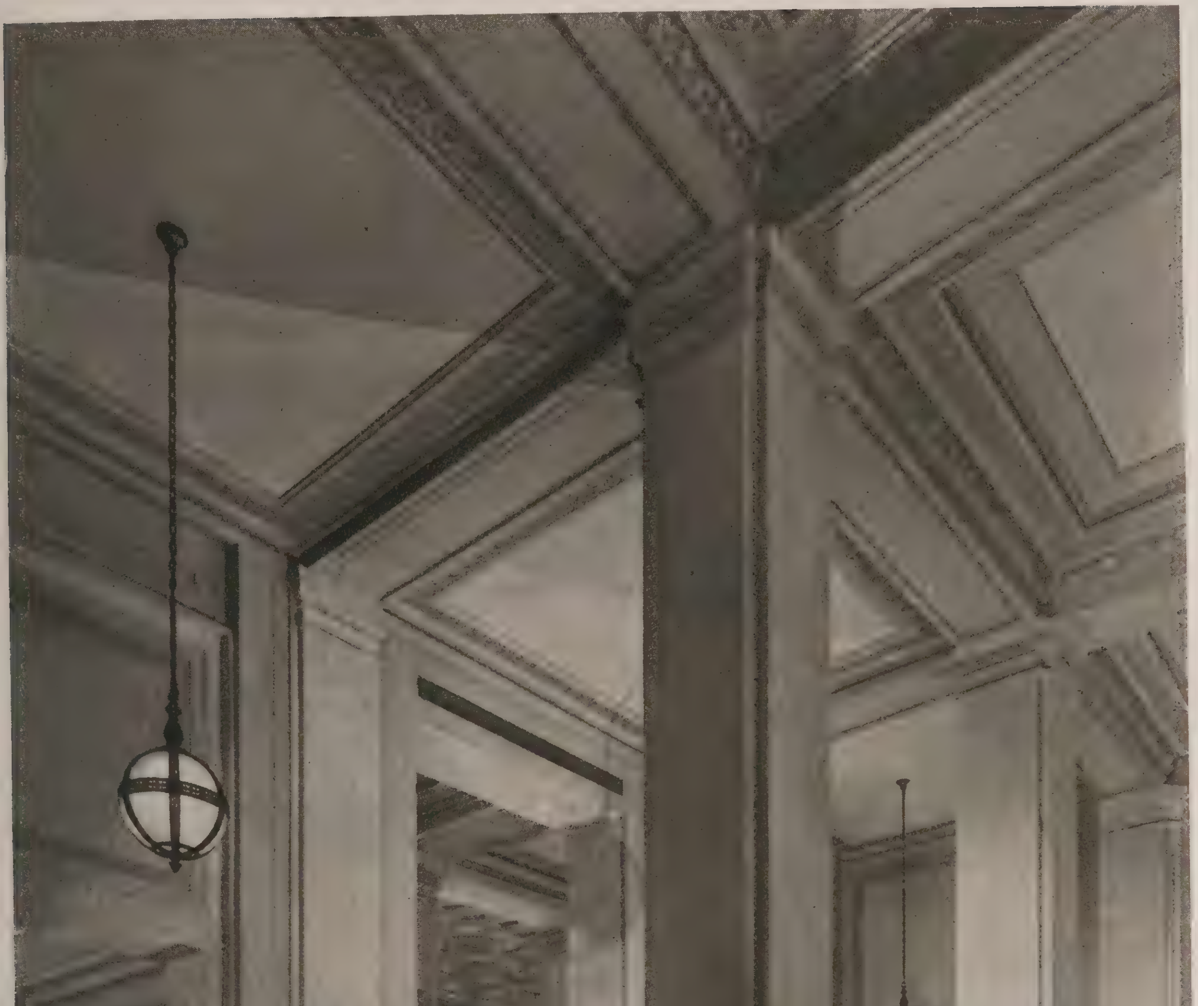

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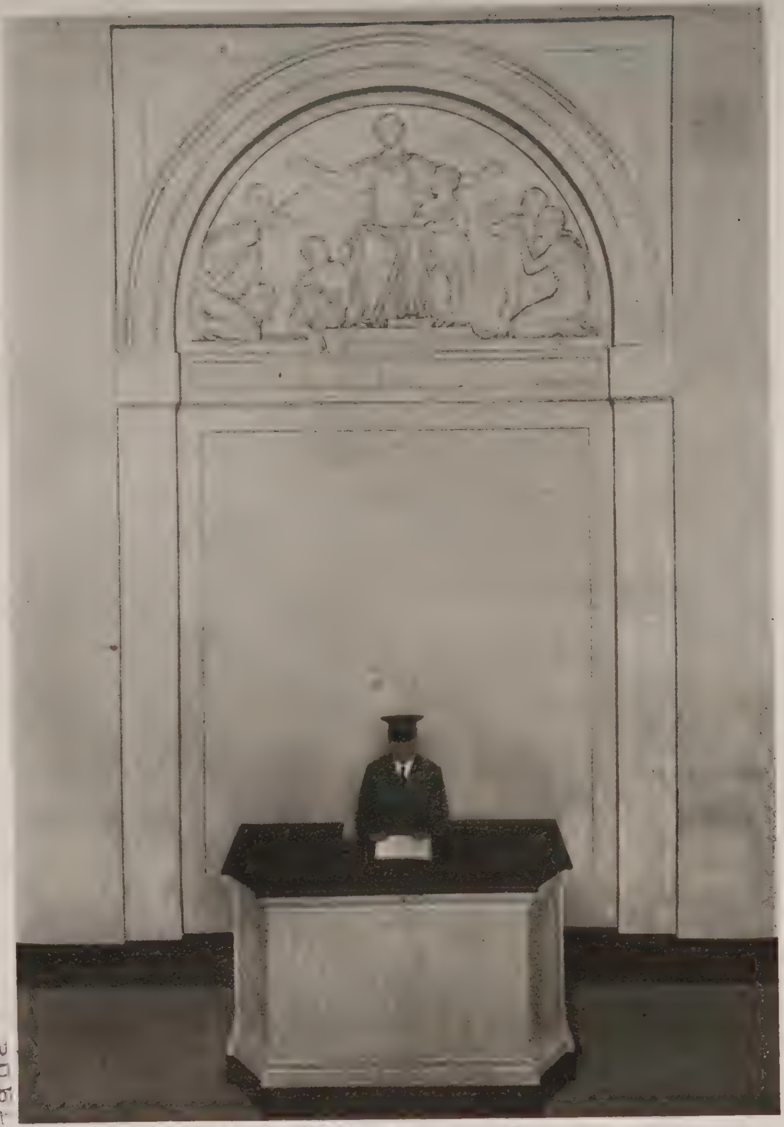

INFORMATION DESK, OFFICE BUILDING LOBBY

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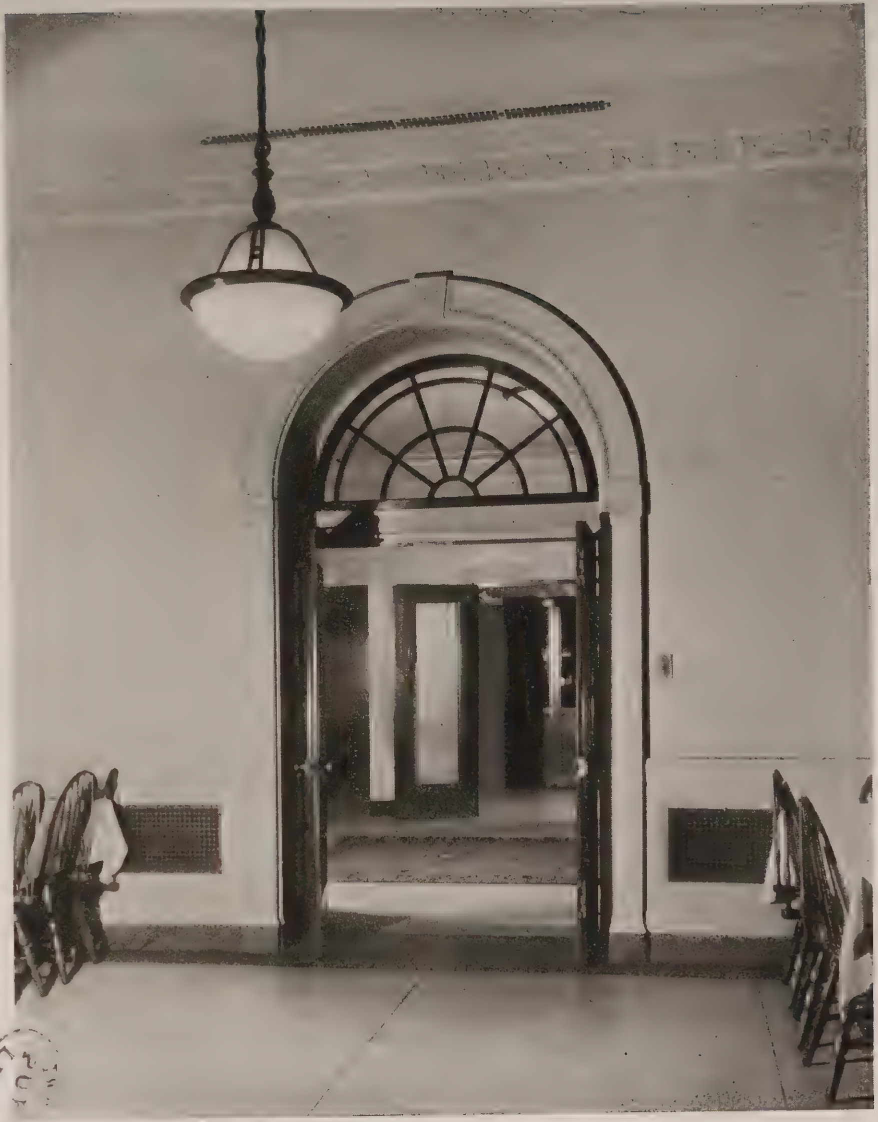

DOORWAY, BANK EMPLOYES' DINING ROOM

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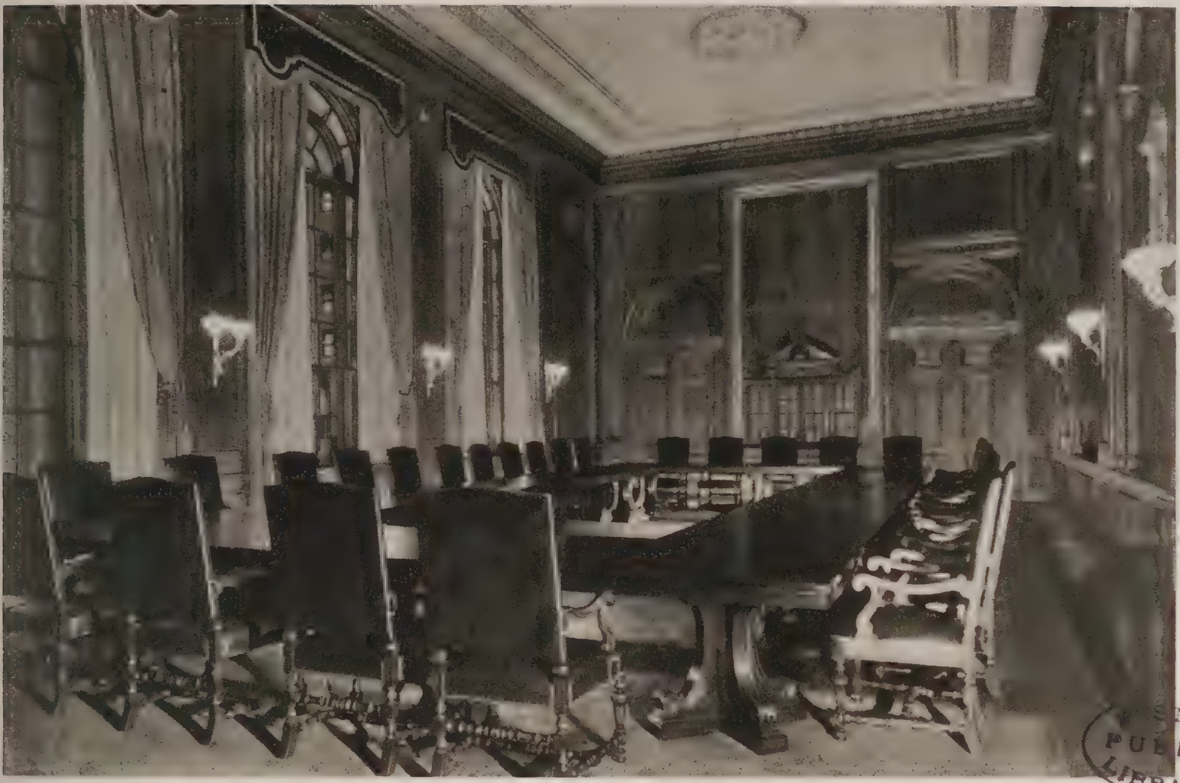
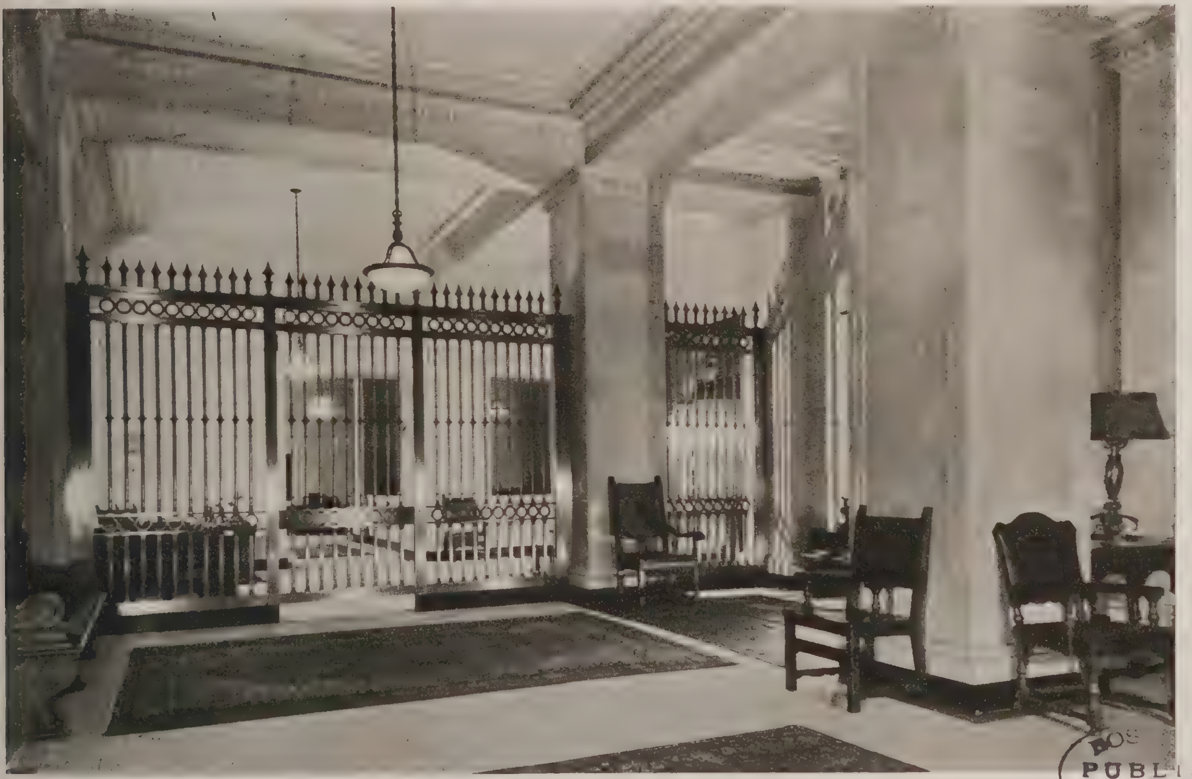


BOARD ROOM



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THE FIDELITY-PHILADELPHIA TRUST BUILDING

SIMON & SIMON, ARCHITECTS AND ENGINEERS

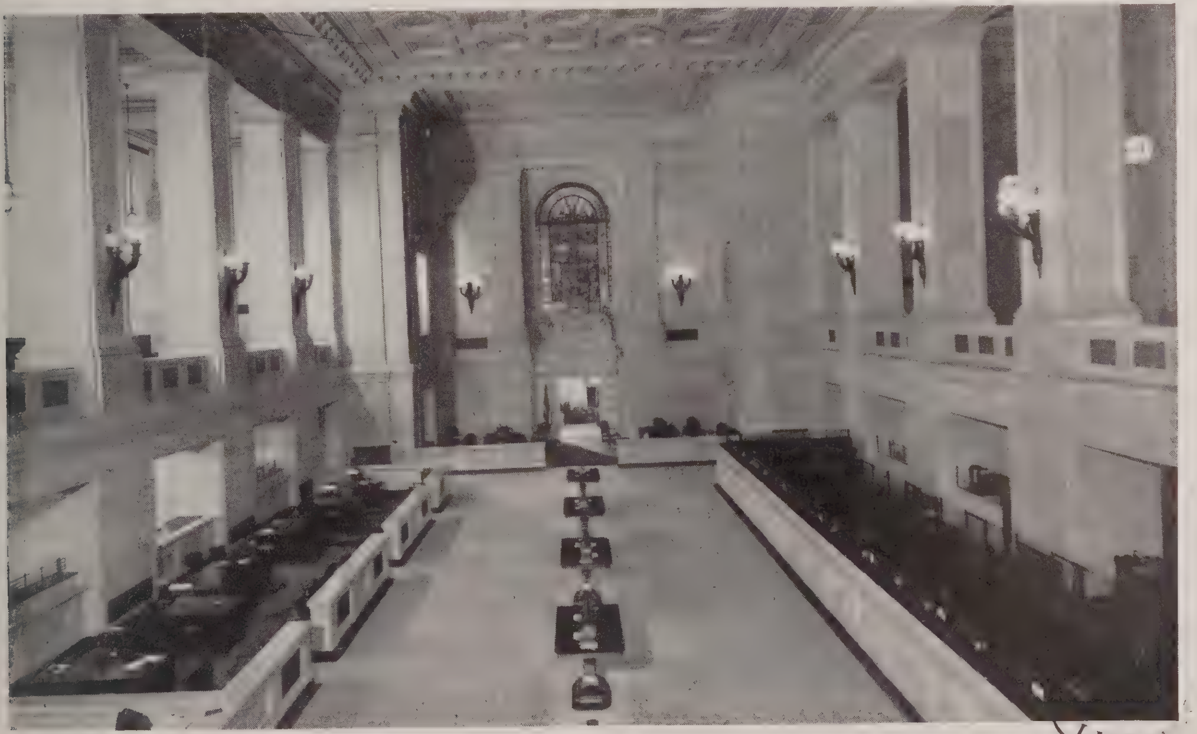
BY

EDWARD P. SIMON

THE recently completed 32-story Fidelity-Philadelphia Trust Building, Philadelphia's largest office structure, stands in South Broad Street, occupying a block frontage of 221 feet, 6½ inches on that street and extending along Walnut and Sansom Streets to a depth of 175 feet, 11 inches. The major portions of the ground and basement floors and all of the first five office floors are used as a banking house for the Fidelity-Philadelphia Trust Company, which institution, through a subsidiary real estate company, financed and owns the building. Twenty-four floors are given over to leased office space, while the top floors are occupied by a luncheon club.

Access to the office building lobby and the elevators is through the entrances at the corner of Broad and Sansom Streets, since this corner of the building lies nearest to the avenues of approach from the most populous parts of the city. The 24 floors of rented offices have a usable floor area of 402,507 square feet or about nine acres. The building has a total usable floor area of 618, 249 square feet or more than 14 acres. Considerable study was given to the provision for such expansion of the banking house as might come through future mergers or from the natural growth of business. It is interesting to note that such a merger actually occurred and at a time when the architects' drawings were still in process and might easily have been altered, but due to the provision which had already been made, it was found necessary to only slightly change the design. Another problem considered by the architects was that of securing the ideal dimensions for office bays and depths. In an endeavor to get expert opinion on this question, the owners and the architects invited a conference of the Building Planning Service of the National Association of Building Owners and Managers. This meeting took place in Philadelphia with delegates arriving from points as far distant as the Pacific coast. After several days of open discussion, a ballot was taken which resulted in the establishment of these proportions as the ideal for an office building of this size: The width of the units to be nearly constant at from 17 feet to 17 feet, 6 inches. The depths, measured on a line parallel to the direction of the light, to be allotted in this way: 45 per cent of the units to be 20 feet deep, 45 per cent of the units to be 25 feet deep, and 10 per cent of all the units to be 28 feet deep.

Two factors determined the choice of the architectural treatment. The problem was to design a building in keeping with neighboring structures and in accord with Philadelphia's conservative traditions and at the same time afford a dignified

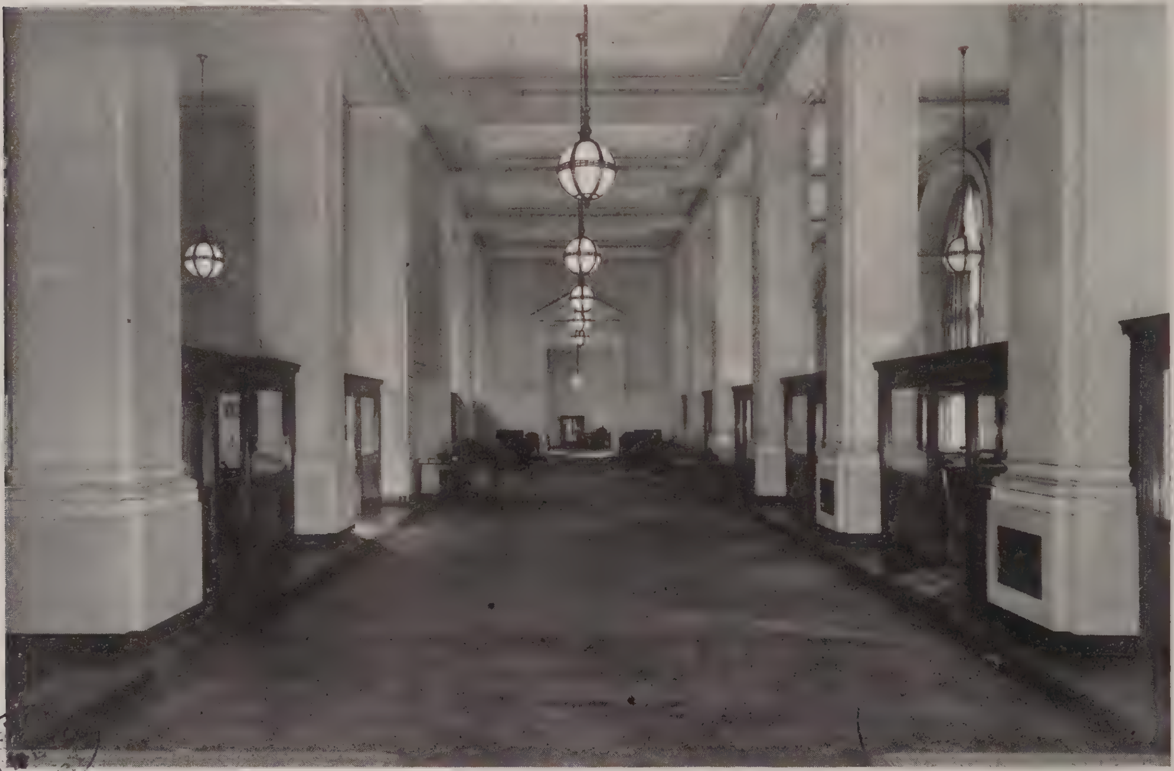


Main Banking Room

LIBRA

style of decoration suited to the character of the banking institution which occupies the dominant position in the structure. Classic design was clearly indicated. As the study in this style of decoration progressed, opportunities were presented for the introduction of a number of sculptural features, notably the spandrel reliefs over the entrance arches, the cornice and spandrels over the board room windows, the coins in relief along the lower facades, the lunette in the office building lobby, and the two figures in the round which support the clock at the end of the banking room's interior. These sculptural contributions as well as the ornamental bronze entrance doors and their frames are the work of Piccirilli Brothers, sculptors, of New York.

The early American coins and medals, represented in a series of medallions above the second floor level on the three facades, seem worthy of a detailed description. Beginning at the west end of the Sansom Street facade, there is a representation of the obverse side of a coin authorized by the legislature of Vermont and minted at Rupert, Vt., by Reuben Harmon, Jr., showing the inscription *"Vermontis Res Publica,* 1785," with a plough in the foreground and the sun rising from behind mountains. At the north end of the Broad Street facade is a representation of an American pine tree three-pence piece with a pine tree in a field under the inscription "Masathusets" and the date, 1653. The next medallion, proceeding south along the Broad Street facade, is a reproduction of the Granby copper with a standing deer and the inscription "Value Me as You Please," dated 1737. These coppers and other coins were struck off by one Highley, a blacksmith, at Granby, Conn. The next coin is the first authorized United States cent. It shows a dial with three hours and the word *"Fugio"* as well as the inscription, "Mind Your Business." On the face of the coin are 13 circles linked to form a large circle. The minting of this coin was ordered by Congress, July 6, 1787. Another Vermont coin is carved at the south end of the Broad Street facade. It shows the "All-seeing Eye" directing its rays upon 13 six-pointed stars and bearing the inscription, *"Nova Constellatio,"* 1783. Two of these coins in silver were found near Newark, Del., in a secret drawer of an old desk that had belonged to Charles Thomson, a close friend of Benjamin Franklin. Turning the corner and at the west end of the Walnut Street facade is the face of the Lafayette medal, commemorating the triumph of the American forces over Burgoyne in the Revolutionary battles at Saratoga, October 17, 1777, and over Cornwallis,



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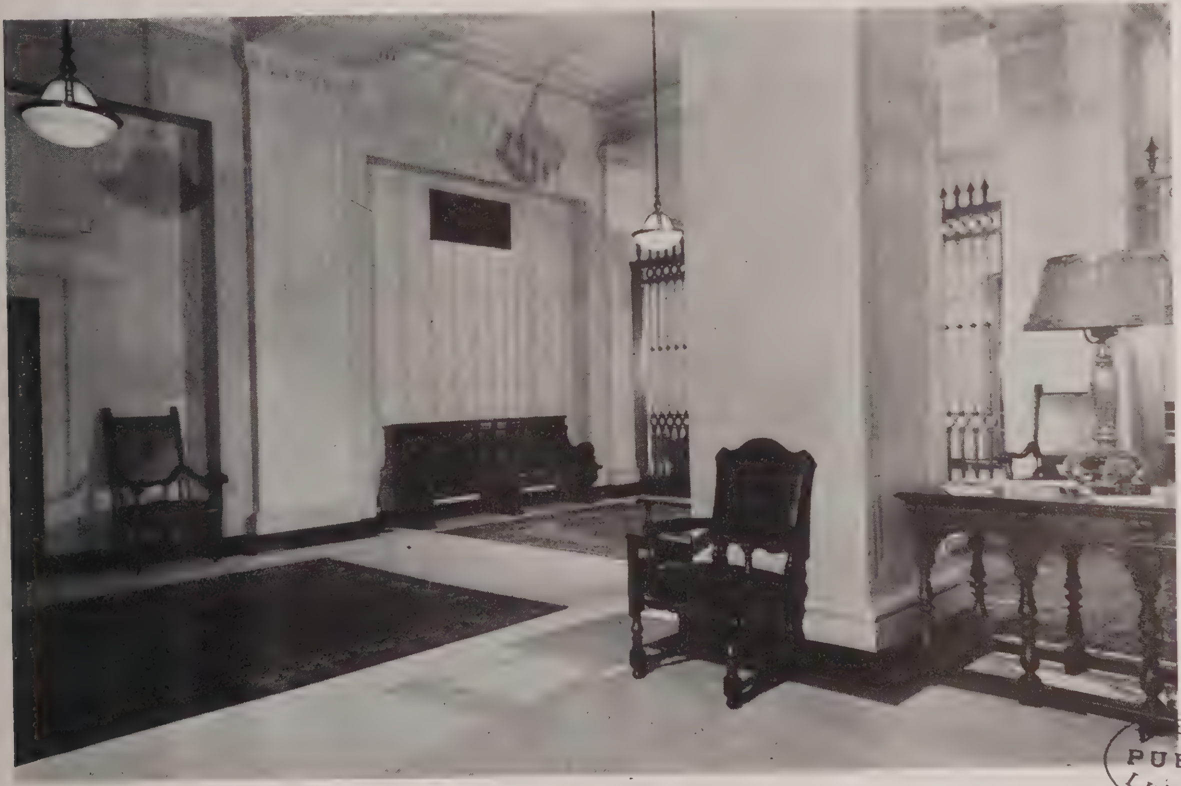
Trust Department
Fidelity-Philadelphia Trust Building, Philadelphia
Simon & Simon, Architects

at Yorktown, October 18, 1781. The reverse of this medal is at the east end of the Walnut Street facade. All these medallions are highly decorative.

Approach to the banking room, through the main entrance from Broad Street, is on the street level. This room is 119 feet long, 54 feet, 11¾ inches wide, and 46 feet, 9½ inches high. The illumination of the room is carried out with the view to giving an even radiation of light to all parts of the working area and customers' spaces and with the further stipulation that the light originate from sources which will be instinctively sensed as natural. To prevent on the east wall the glare that must have resulted from the dependence on or accentuating of the daylight coming from the Broad Street windows, it was thought advisable to include an apparent source of light in this wall, which was accomplished by use of a stained glass window. This records historic incidents of Philadelphia and contains as well medallion portraits of famous Philadelphians. It is one of the best in the city and one of the few in the country devoted exclusively to the portrayal of secular history. This window and the leaded window over the main entrances were created by the D'Ascenzo Studios, Philadelphia.

Direct illumination, falling at a natural angle from side brackets, fills the banking room with a soft, even glow of light. Incidentally, it may be interesting to note that this is believed to be the largest banking room in America to be lighted solely by side brackets. Honed Tavernelle Claire marble forms the walls and wainscoting of the room. There were imported from the Chiampo quarries, near Verona, for the interior facings of the building, 20,000 cubic feet of this marble. The coffered ceiling of the room is modeled in plaster and decorated in soft coloring in key with the marble walls. An ingenious system allows the ceiling to receive its occasional cleaning from scaffolds to be suspended from invisible attachments in the ceiling itself. Along the south side of the banking room is the tellers' space. Polished marble counters surmounted with screens of bronze and glass of the low type eliminate the familiar tellers' cages. Along the north side and at the east end of the public space are marble railed divisions for officers.

Six private bank elevators, four for customers and two for employes, as well as stairs, give access to the trust department on the second floor. Here, as on the first floor, the public area is in the center with rooms for officers along each side, and as elsewhere in the bank's quarters, the wood used in the trim is prima vera (white mahogany). From this second floor, balconies overlook the main banking space. The north and east portions of this floor are occupied by the



Lobby, Safe Deposit Department
Fidelity-Philadelphia Trust Building, Philadelphia
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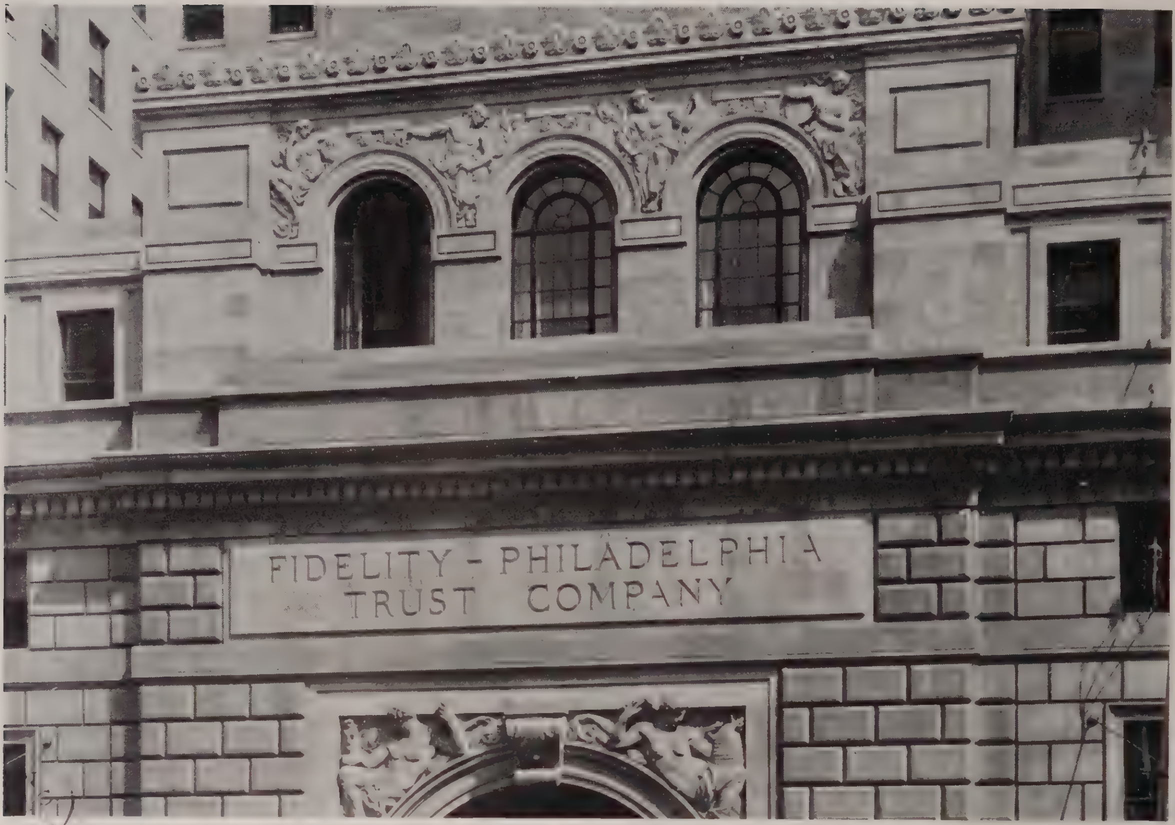

Detail, Main Entrance to Bank
Fidelity-Philadelphia Trust Building, Philadelphia
Simon & Simon, Architects

tax departments and the library. Facilities for the trust accounting department are provided on the third floor, and here also is the income tax department available for service to clients in the preparation of returns and other tax matters. On the fourth floor are the photostat department, the mimeograph and duplicator, general ledger, bank bookkeeping, transit, mail, addressograph, general index and files departments. Girders at the fourth floor level spanning a distance of 60 feet support the entire central part of the 27 stories, form the ceiling of the main banking room below, and eliminate all vertical obstructions from the most important space in the building. As the girders are nearly 10 feet in depth, the space between them is utilized for the general files. A first aid dispensary and infirmary are on this floor, intended for the service not only of the bank and its patrons, but also for building tenants, their employes and visitors. The board room, which forms a dominant feature of the main facade, is reached by private elevators. This room is finished in prima vera, its deep texture and warm color accentuated by touches of dull gilding and a gold clock on the wall. The board room has as dependencies an ante room and a small committee room, with interiors to harmonize. On this same floor, the fifth, are the officers' dining rooms and the dining room for employes where three hundred persons can be served at one sitting. A kitchen with ample equipment provides for the preparation of meals. The real estate department, with its many activities and sub-divisions, is located on the sixth floor. For the safeguarding of thousands of important documents, a large vault is provided immediately adjacent.

In addition to its size, this building is noteworthy on account of the exceptional quality of materials employed and the remarkable speed with which it was erected. The outer veneer above the base of pink granite is of selected buff Indiana limestone, while all the door and window frames are of bronze. From the time wreckers began clearing the site until the Baltimore & Ohio Railroad ticket office was open for business on the ground floor of the new building, there had elapsed a few hours less than one year. Within four months more the structure had been completed and turned over to its owners and their tenants. To a time-sensitive people this achievement is not lacking in a certain dramatic quality.

THE CHURCH OF INFINITY

BY

FRANCIS S. ONDERDONK

INSTRUCTOR IN THE COLLEGE OF ARCHITECTURE, UNIVERSITY OF MICHIGAN

PROFESSOR H. E. BARNES called man a "temporary chemical episode on a celestial juvenile and cosmic dwarf." Orthodox priests who had ignored astronomical discoveries were shocked, and freethinkers rejoiced. But progressive friends of religion who derive no income by propagating an ancient creed will say in accord with H. G. Wells, Sir Oliver Lodge and L. N. Tolstoy: "Yes, we are weak primates on a cosmic dwarf, but yet part of an infinite universe, at least one so vast that the term infinite best describes it; we are transitory and stand with one foot in our graves; but with our arms we touch infinity, and eternity is our background. This is our tragedy but likewise our opportunity. We cannot rest content at the fireplace but must seek to explore the Antarctic or try to fly across the Atlantic; a slow train makes us feverish, and races thrill us into a higher state of being. Yet these are substitutes used by moderns who do not know how to scale infinity by the aëroplane of the soul,—faith; who have lost the knowledge of quenching their thirst for the eternal by developing an inner fountain."

Architecture symbolizes the thoughts and longings of an age unless it hypocritically masquerades in the symbols of a past generation. That the parabola is the geometrical expression of the "half finite, half infinite" consciousness of our age was discussed in an article in Part II of THE ARCHITECTURAL FORUM for November; that its structural virtues were discovered by the engineers and that the liquid quality of concrete makes possible the introduction of such a subtle arch with ever-changing curvature were likewise pointed out. New examples of the application of parabolic or elliptical arches are to be seen in the gymnasium of the school in Suresnes, France, in the hall of the Royal Horticultural Society in London, and in the main halls of the Czechoslovak Exposition at Brunn, Moravia. In the latter instance the upper part of the vault consists of a network of concrete ribs framing glass panels; it proves that the para-

Pallotiner Church, Limburg

J. H. Pinand, Architect

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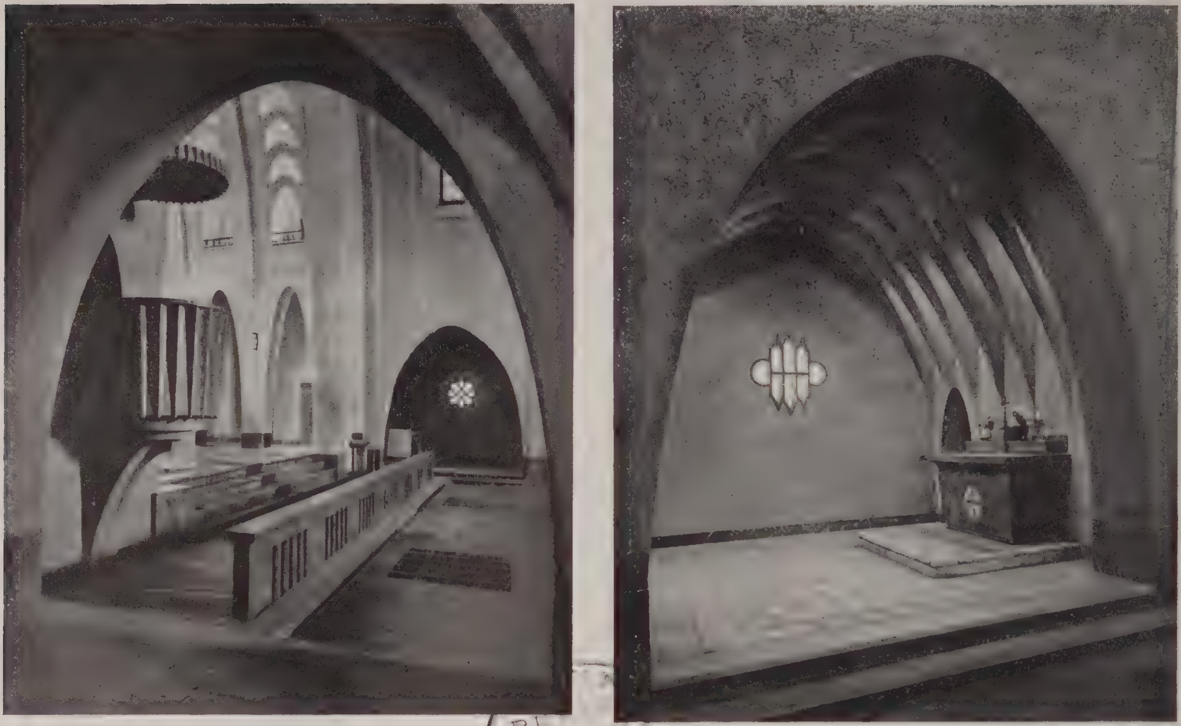

PULPIT AND APSE

SIDE CHAPEL

Pallotiner Church, Limburg
J. H. Pinand, Architect

bolic churches of Professors Bohm and Pinand could have been as light as those of Perret had they chosen to use this type. The administration building of the J. G. Farbenindustrie, in Hochst-on-the-Main, Germany, is connected with the rest of the plant by a parabolic street bridge; this arch is echoed in the tower windows as well as in the third story fenestration which shows that Professor Peter Behrens appreciates the value of the parabola. The most remarkable recent use of a parabolic vault is shown in the Pallotiner church in Limburg-on-the-Lahnriver, Germany. That this modern structure is a church for orthodox, conservative Catholics is one of the anomalies of which our present age possesses so many. It marks its designer, J. H. Pinand as one of the foremost architects of our generation.

Maybe the reader resents the word "modern" when used by architects as much as does the writer. Mr. Cram, with partly justified abhorrence, lashed modernism in the September issue of the *Journal of the A.I.A.* and gave ferro-concrete a few blows which the author of "The Ferro Concrete Style" cannot leave unanswered. There exist as many modern styles as there exist modern architects, and all the excitement is caused by the fatal habit of generalizing. In politics the same mistake is often made; one says: "The French do this and that, the Germans are so and so," which prompts the question, "Do you mean the royalist, Daudet, or the socialist, Jean Jaures, or Mr. Coue, when you speak of the French?" So before discussing modernistic architecture, one must first agree on which variety of modernism is being debated. Just as the progressive, republican Germans and the reactionary, war-loving German *Hakenkreuzler* hate one another much more than the Germans ever hated the French, so among modern architects there are wider chasms than there are between certain types of modern design and historical precedent. The churches of Professor Bohm and J. H. Pinand may be considered more closely related to Gothic tradition than to some of the angular barns considered modern churches by many contemporary architects.

One can divide modern art into two distinct groups. One group is decadent, with "artists" who mock the public by purposely disobeying all laws of beauty, hoping to win publicity and money by their monstrosities; some of this decadent group may be sincere, but mentally diseased. This decadent group is more represented in painting than in architecture, since architecture is protected by the laws of statics, building codes and the demands of people who intend to use the buildings. The distorted features of some "modern" portraits and the convulsions into which their painters torture the human form prove that these paintings are the product of insanity. Actually, inmates of insane asylums have defiled canvases in so similar a manner that they could be exhibited in a salon of "modernists." Modernists of the second group are full of the artistic expression of a new age and a new religion; they too are no longer

LOBBY PULPIT

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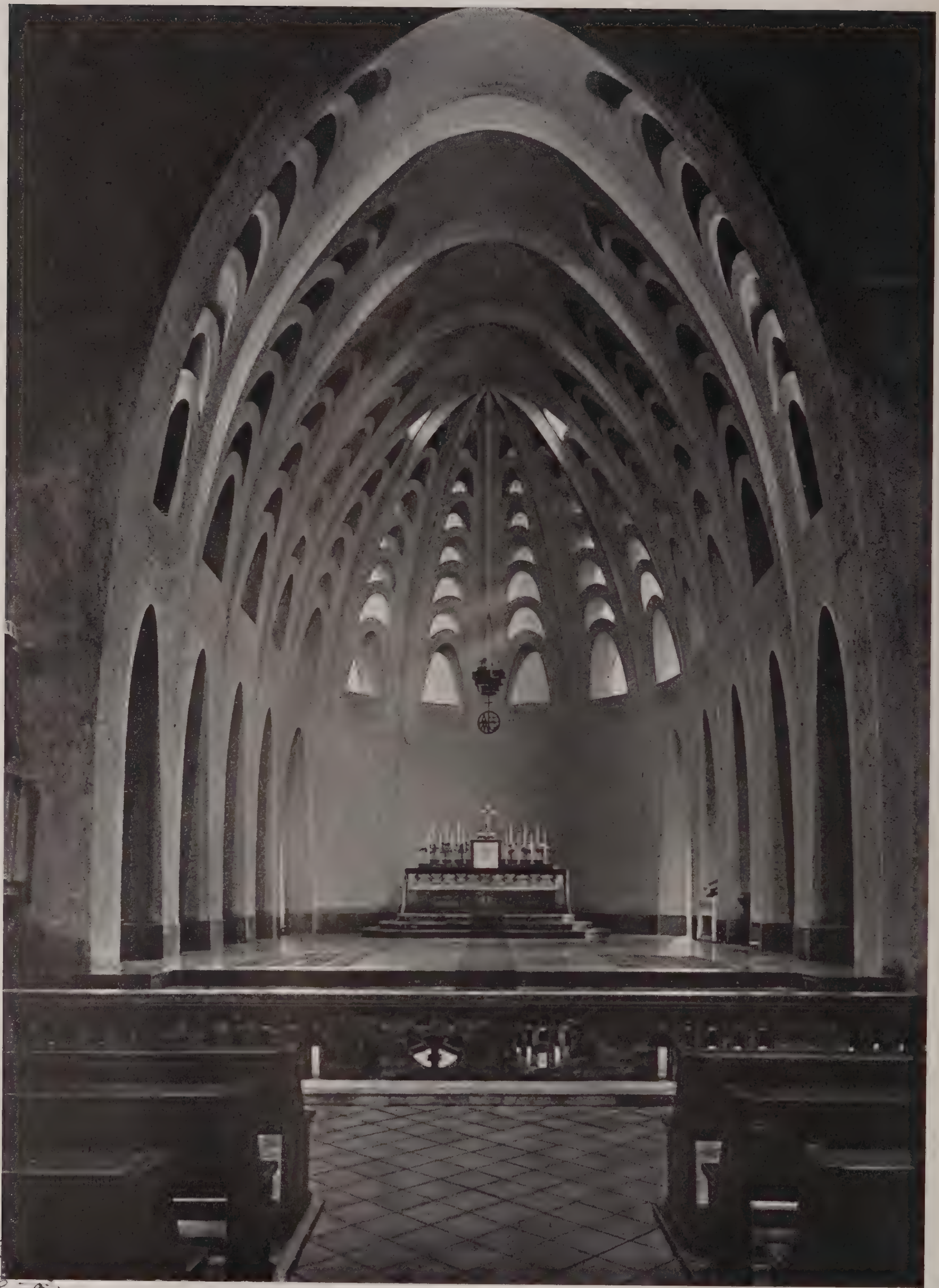
Pallotiner Church, Limburg
J. H. Pinand, Architect

using traditional forms, but they are putting their best logic and sentiment into their creations. These have sometimes a primitive, crude expression, for naturally pioneers err from the right trail at times. Striving to find new symbols for their new messages, their utterings may sometimes be mistaken for those of decadent bluffers and lunatics. But as a rule health and truth are discernible in the embryo of the New Age style and distinguish it very definitely from the stench of the corpse of a decadent, immoral, aimless culture. Mr. Cram has made the mistake of throwing these two very different kinds of modern style on one pile, inviting us to burn the whole as rubbish. Let us rather remember Christ's parable of the wheat and the tares, which is full of significance.

Mr. Cram amplified his article "On Decadence in the Arts of France" with some illustrations, among which were the Le Raincy and Montmagny churches of the Perret brothers. Yet they belong to the second, healthy class of modern architecture and develop the Gothic tradition of making the church a colored lantern by having the entire walls grilles framing pieces of colored glass. How then can Mr. Cram claim that the designers "ignored all considerations of the Catholic religion as such . . . rejected all the canons of beauty as these had existed for three thousand years . . . "? What would Mr. Cram have done with only $30,000,—the price of Le Raincy,—at his disposal? Perret's churches are crude and bear the stamp of hasty construction,—but they have the beauty which intelligence dominating dull matter always produces. An example of the decadent school in modern architecture is the barn-like *Goethaneum* in Dornach, Switzerland, which deserves all the disdain which Mr. Cram heaps on the ferro-concrete style as a whole (whereby he denies its very existence).

Professor Bohm's parabolically vaulted Bischofsheim church possesses the advantage over the Perret type in that it made the curved form supreme. The angularity which conservatives dislike characterizes the "wood-centering style," the earliest, most primitive stage of ferro-concrete building, in which the wooden forms but not the liquid contents were expressed. "Liquid stone," as the name implies, is better suited to curved forms than any other structural material, and as soon as the designer realizes that concrete can be formed with self-centering metal lath, with curved metal forms or with very thin, bendable wooden boards, he will rid himself of the now prevailing idea that concrete demands angular shapes and straight planes. Unquestionably, Perret's designs are too much dominated by angularity; but they stress concrete tracery, use of which is one of the main characteristics of the perfected ferro-concrete style; the large amount of light introduced into Perret's churches, and the wonderful display of color they permit, present advantages which the Catholic church in Bischofsheim lacks; the latter has a crypt-like aspect due to its narrow windows, which belong in the Romanesque period.



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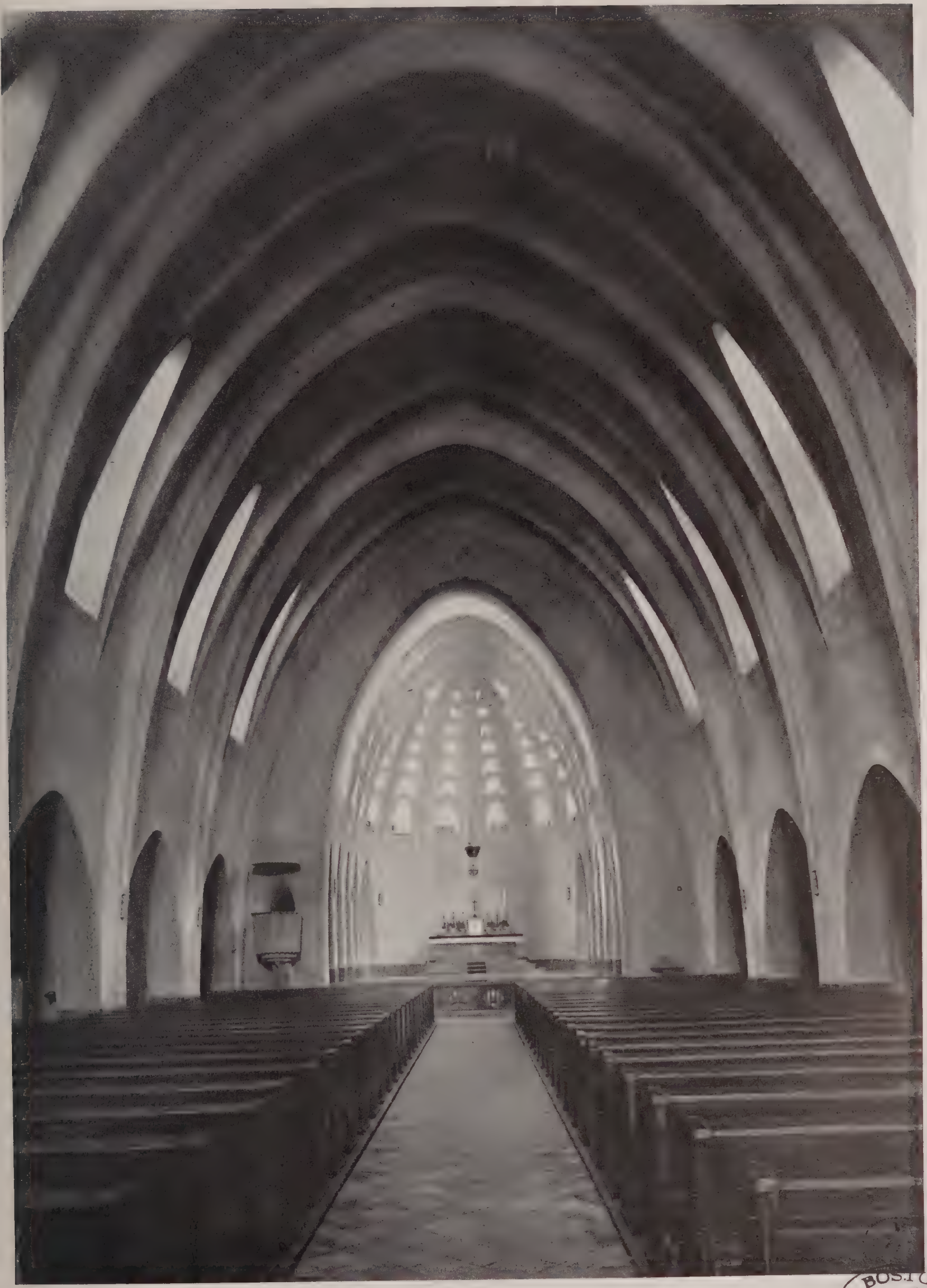
CHANCEL
PALLOTINER CHURCH, LIMBURG
J. H. PINAND, ARCHITECT



GENERAL VIEW OF INTERIOR
PALLOTINER CHURCH, LIMBURG
J. H. PINAND, ARCHITECT

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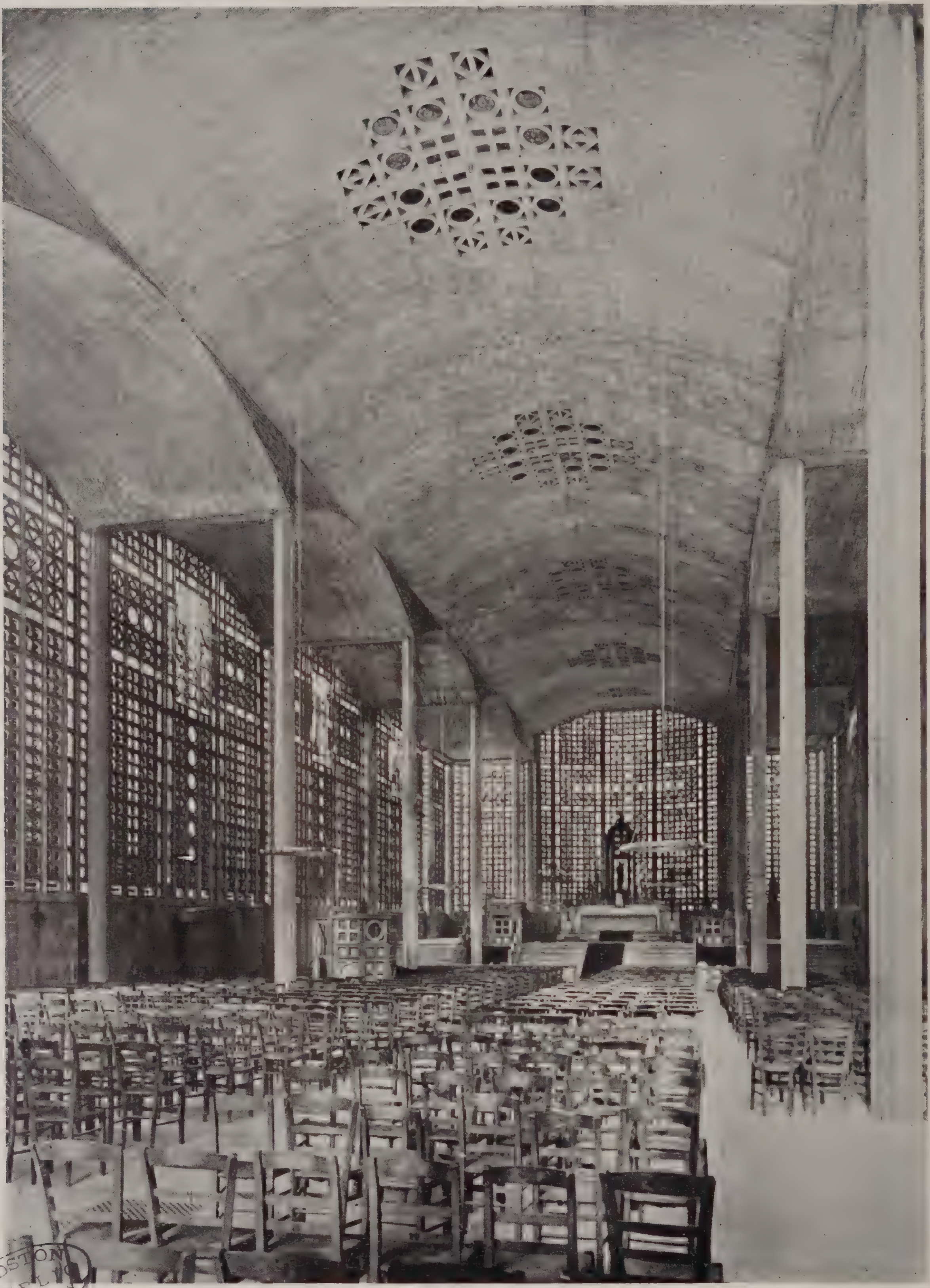

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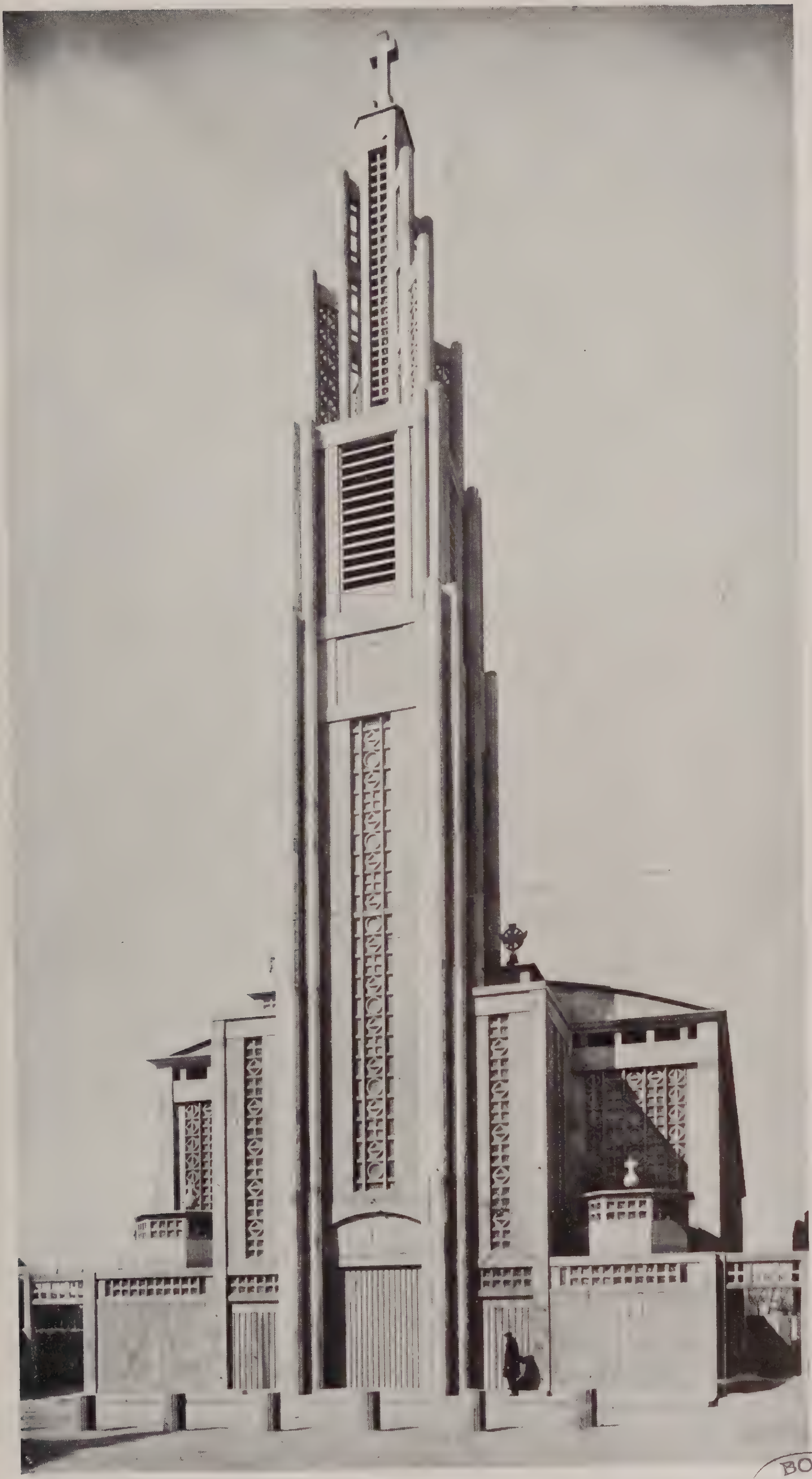
INTERIOR
CHURCH OF NOTRE DAME, LE RAINCY
A. & G. PERRET, ARCHITECTS



EXTERIOR
CHURCH OF NOTRE DAME, LE RAINCY
A. & G. PERRET, ARCHITECTS

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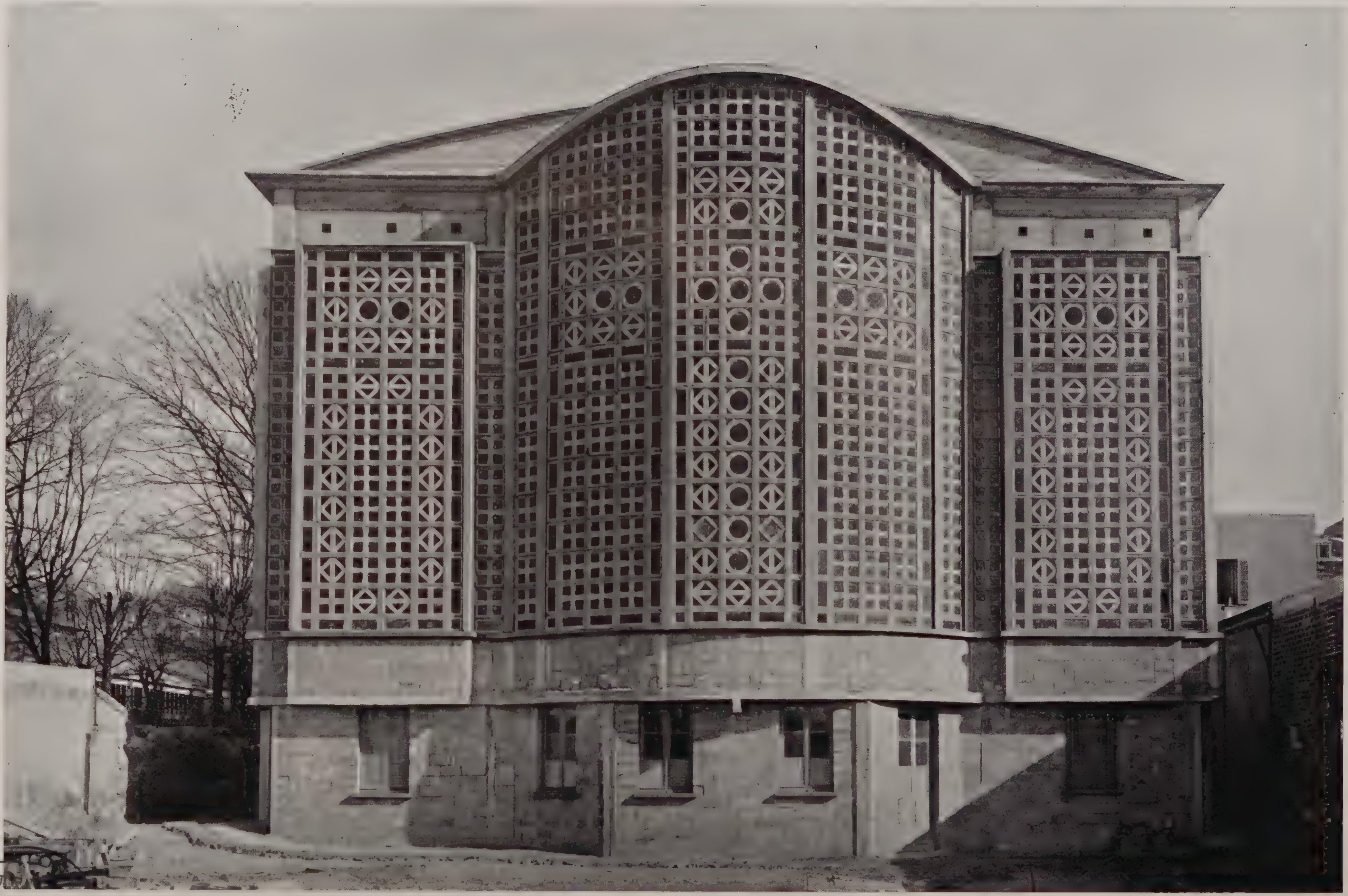
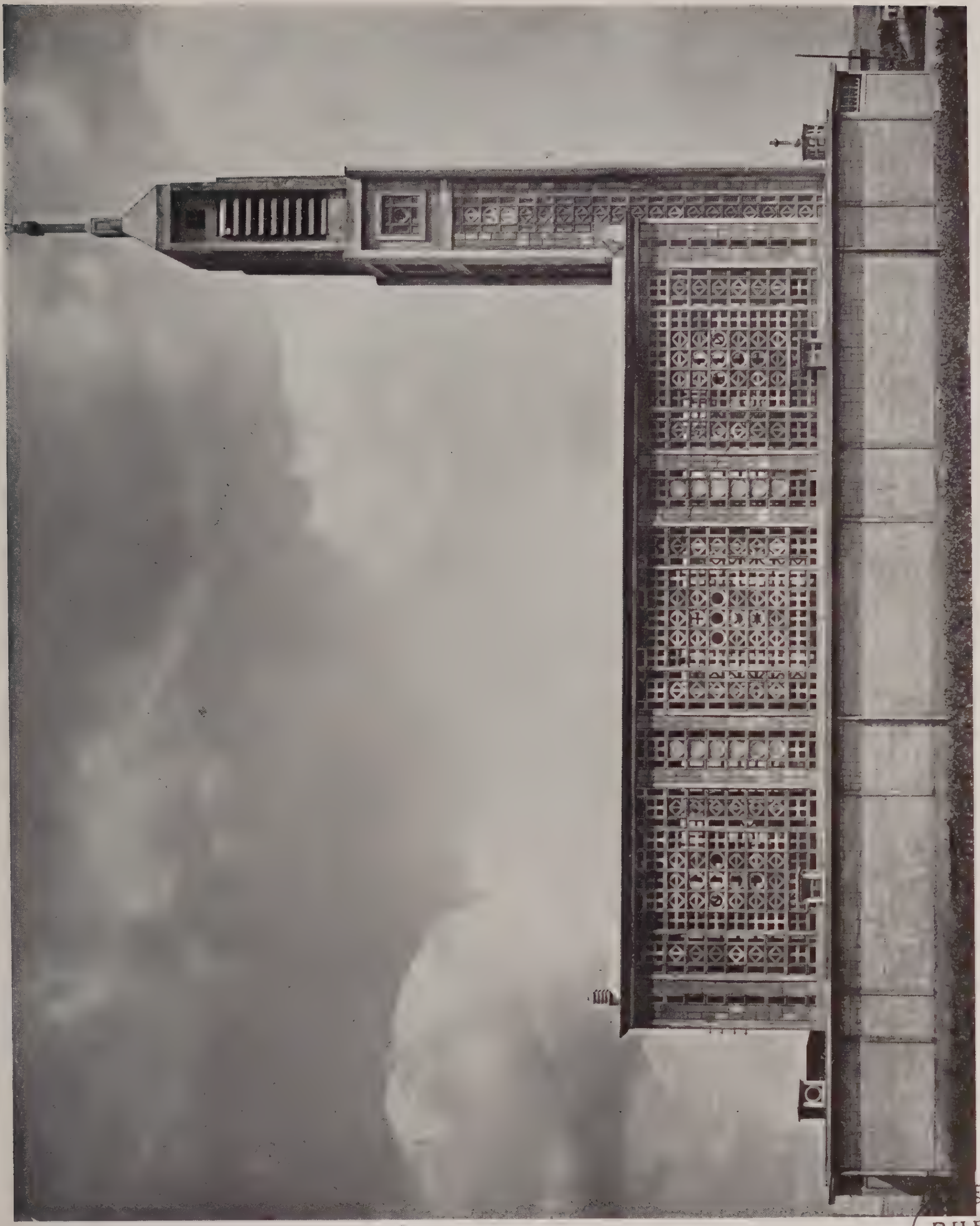


VIEW FROM EAST, CHURCH OF NOTRE DAME, LE RAINCY

A. & G. PERRET, ARCHITECTS



NORTH ELEVATION
CHURCH OF ST. THERESE, MONTMAGNY
A. & G. PERRET, ARCHITECTS

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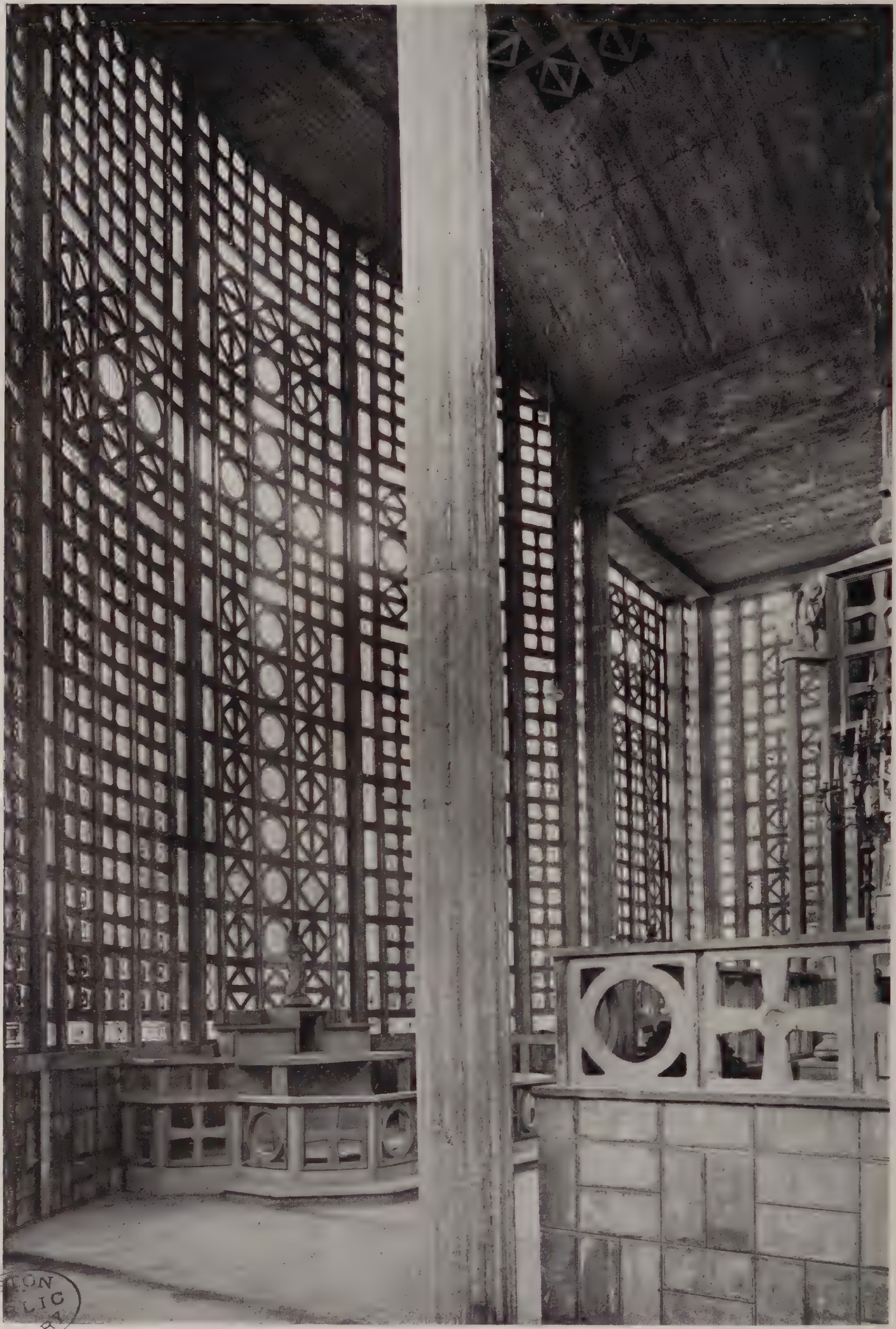

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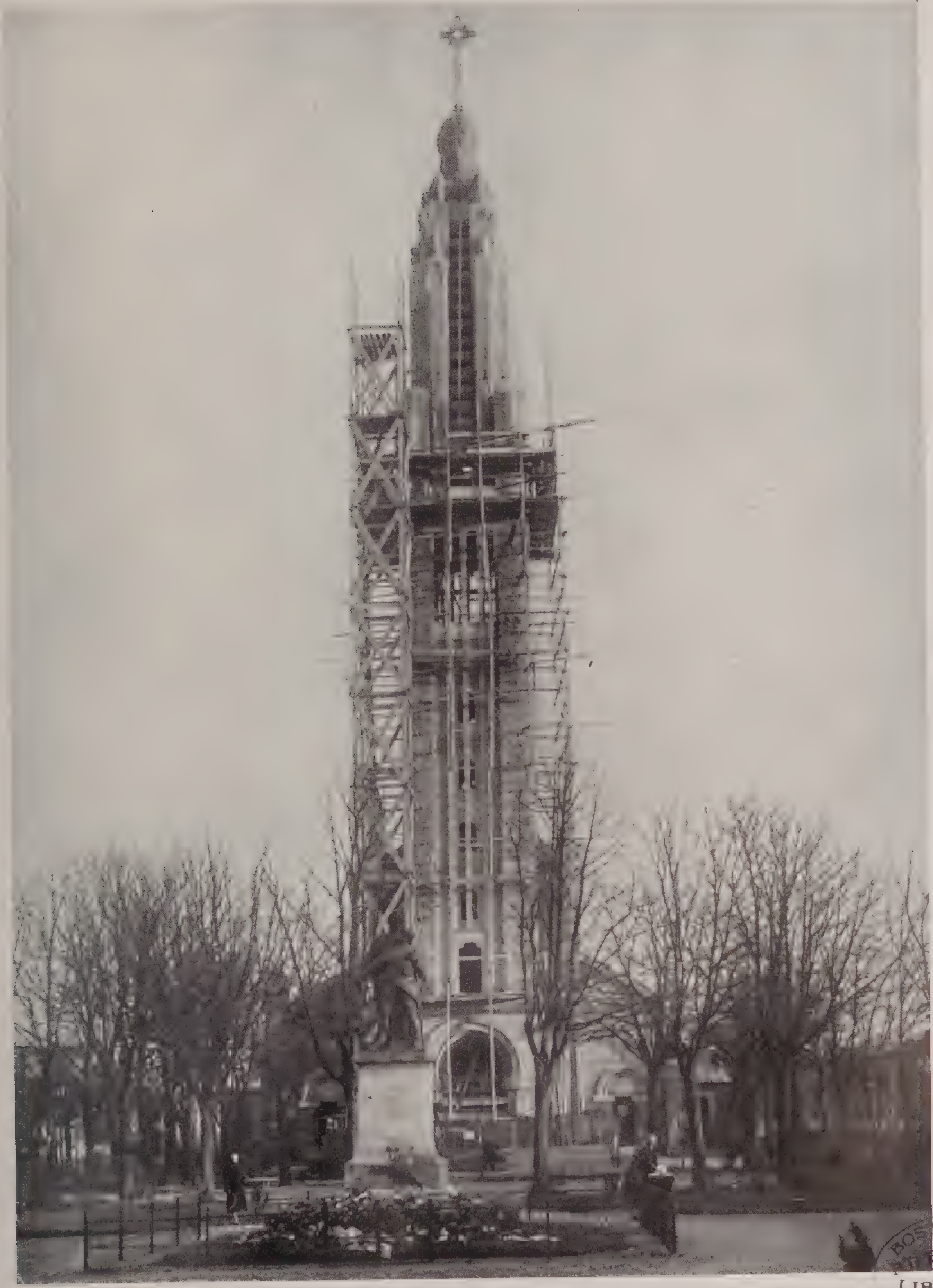
DETAIL OF APSE
CHURCH OF NOTRE DAME, LE RAINCY
A. & G. PERRET, ARCHITECTS



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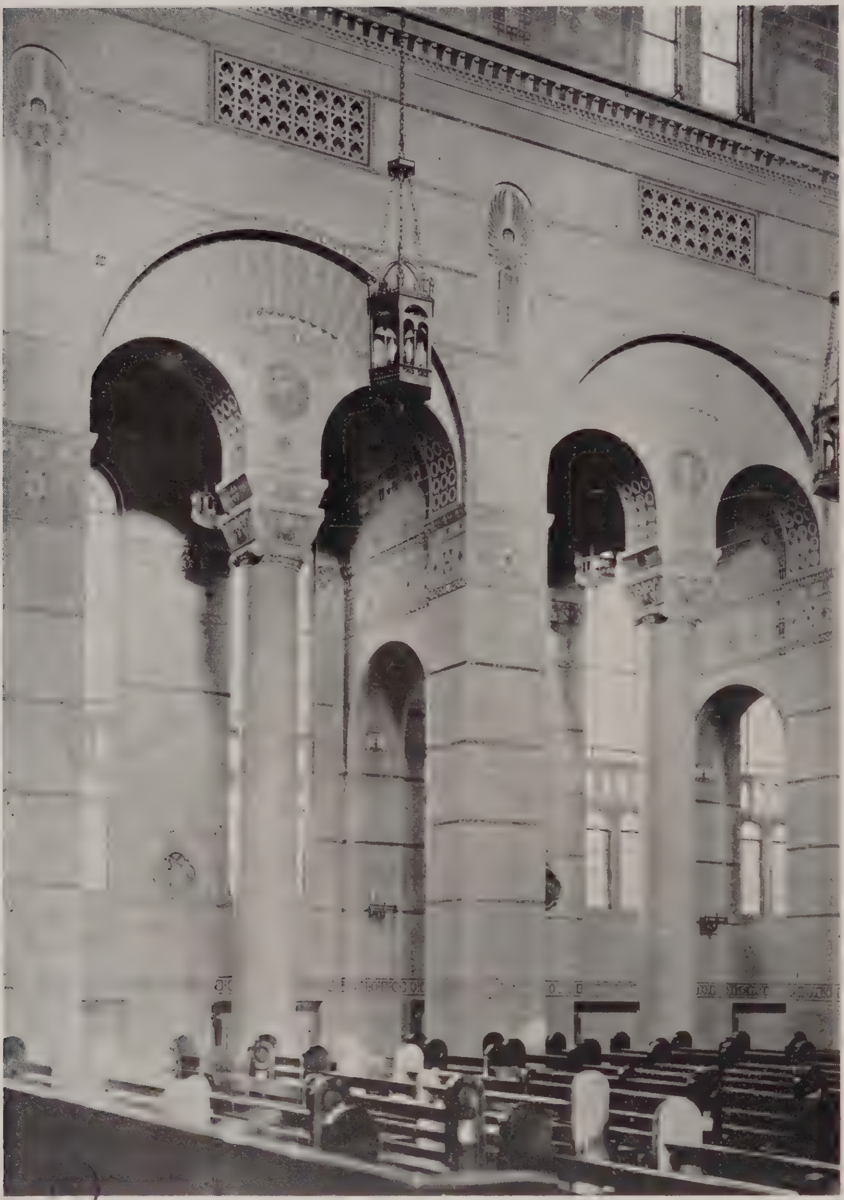
FERRO CONCRETE CHURCH OF ST. LOUIS, VILLEMONBLE
PAUL TOURNON, ARCHITECT
SARREBEOLLES, SCULPTOR



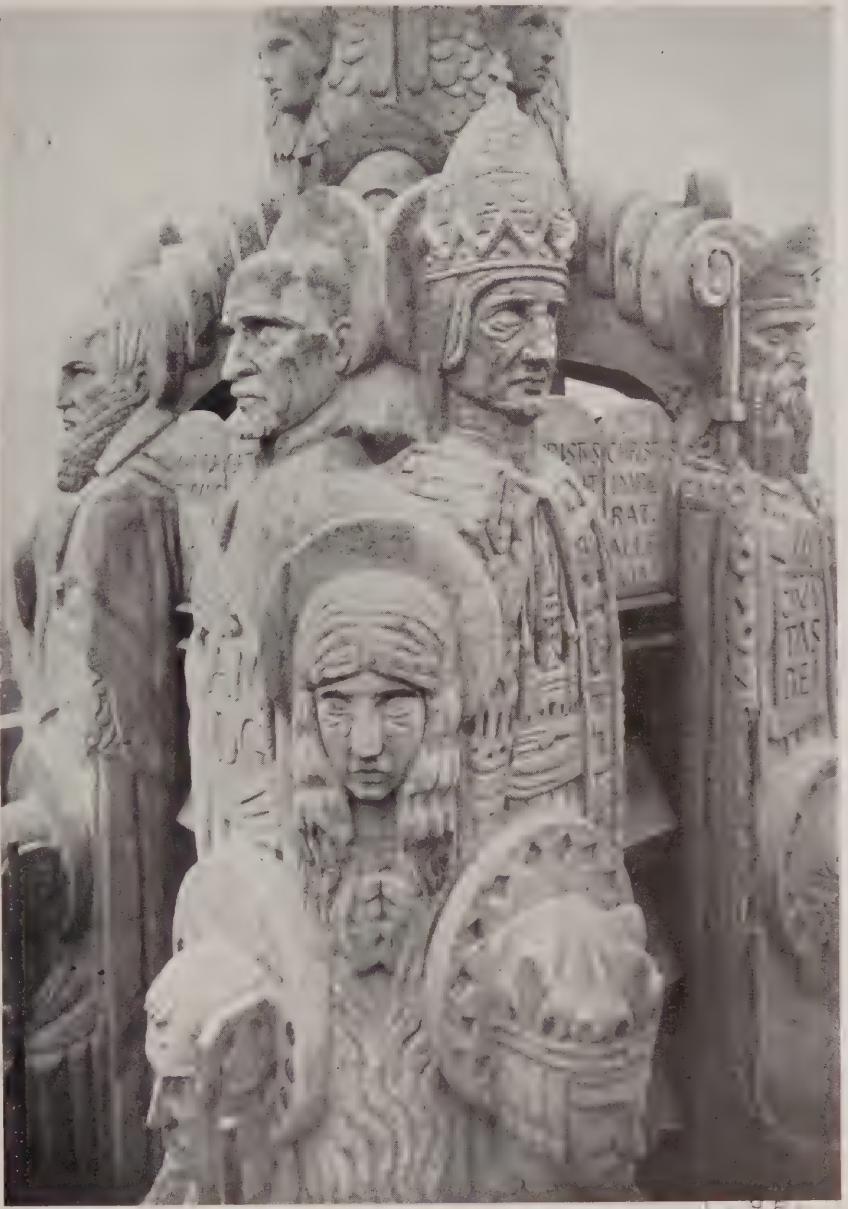
Interior, Church of the Sacred Heart, Washington

Yet we must be grateful to both of these designers, for each has materialized one outstanding feature distinguishing the ferro-concrete style.

J. H. Pinand's church better illustrates use of the perfected ferro-concrete type than does Professor Bohm's in that not only is the nave a parabolic vault but also the windows and the arches supporting the cloister roof are parabolic. It admits more light and is not as oppressive as the Bischofsheim church, due to its parabolic clerestory windows. It is to be regretted that each church masks a novel interior in a more or less Romanesque exterior in which a few pointed arches occur. The most delightful part is the choir, a "lantern" in which successive tiers of parabolically arched windows convey a rhythm and elasticity that suggest sprays of water whirling out of a fountain at different levels, following parabolas as they mount and fall, obeying the recognized laws of gravity.

These parabolic arches are examples of concrete tracery as understood in the broadest sense. Semi-traditional concrete tracery is visible in the side chapels shown on page 178. Tracery is not yet understood as well by Pinand as by Perret, for only the latter replaces all walls by grilles. In the combination of parabolic arches and modest tracery application the Pallotiner church is closer to the perfected type than either Perret's building or Professor Bohm's churches. Professor Wienkoop, director of the Darmstadt Architectural School, in writing of the Pallotiner church, speaks of revelations in the design of churches made during the last two or three years (especially of Catholic churches). He condemns churches built in the new style of Le Corbusier and approves of those which, like the Pallotiner church, show the architect's understanding of religion, ". . . his having grasped cosmic universality as a completed whole . . . primeval-eternal experiencing of the harmony of all visible and invisible . . . it is more than an attempt; I consider it an epochal step in the evolution of modern church design . . ; nowhere is there a harshness which forces the eye to halt. Thus it vibrates in spiral lines toward the center and is captivated, bodily and spiritually, by the vision point of the altar. The church is connected with a monastery, and hence the ten chapel-like niches which replace the customary aisles. . . . Courage was needed to arrange the lighting of the nave by narrow windows which are hidden from view on the interior by very deep reveals."

The highest type of church of the ferro-concrete style will combine two features. Space will



Figures on Church of St. Louis, Villemonble

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be enclosed by a parabolic vault in which walls and roof will merge into each other. All apertures will be covered by parabolic arches. Concrete tracery will make up all surfaces, but it will not consist of the simple geometrical shapes employed by Perret; rather it will have pictorial content produced by the silhouette effect of the concrete backed by interstices. A variation of this type will maybe have a parabolic plan, with the pulpit placed at the focus. Designs of this type of auditorium were submitted for the League of Nations Palace competition. The ramped floor of Notre Dame, Le Raincy presages that the future type may have a curved floor.

As the significance of the parabolic arch was described in a former article, pictorial concrete tracery will now be defined. Frank Lloyd Wright has built several residences in California, some of which are so adorned. These ornamental voids give a decorative effect from without as well as from within. Since the ancient days in which the first true arch was constructed, nothing more revolutionary than the tracery walls of Perret and the pierced tapestry walls of Frank Lloyd Wright has been created. And yet these are mere beginnings; the surfaces of the perfected ferro-concrete church will represent the parables of Christ, and symbolic figures in concrete will be silhouetted against stained glass. The term "tracery" may be misleading for this new type of wall treatment, as it will in no way resemble the tracery of historic styles. The concrete framework of arches (piers) and girders which form the skeleton will become veritable frames for pictures and ornaments wrought in concrete tracery. Gothic tracery bars were limited in thinness; reinforcement by aluminum wire will make possible creation of very thin rods in concrete tracery. Gothic tracery partly served to strengthen the window panes; in concrete tracery this will be of only secondary importance since the new tracery will act as bracing for the bearing members. The reinforcement will tie concrete tracery and structural frame into one,—will make the entire wall a rigid unit pierced by holes,—holes that tell a story.

The modern architect must take the psychology of our present-day life into account. Hundreds of impressions, electric signs and glaring displays enter our vision, and motion pictures bring our nerves to a tense pitch. The ornament and the bas-relief sculpture of traditional type cast too pale shadows and remain unnoticed. John Ruskin's contention that the power of architecture depends on the quantity of its shadow is very true.

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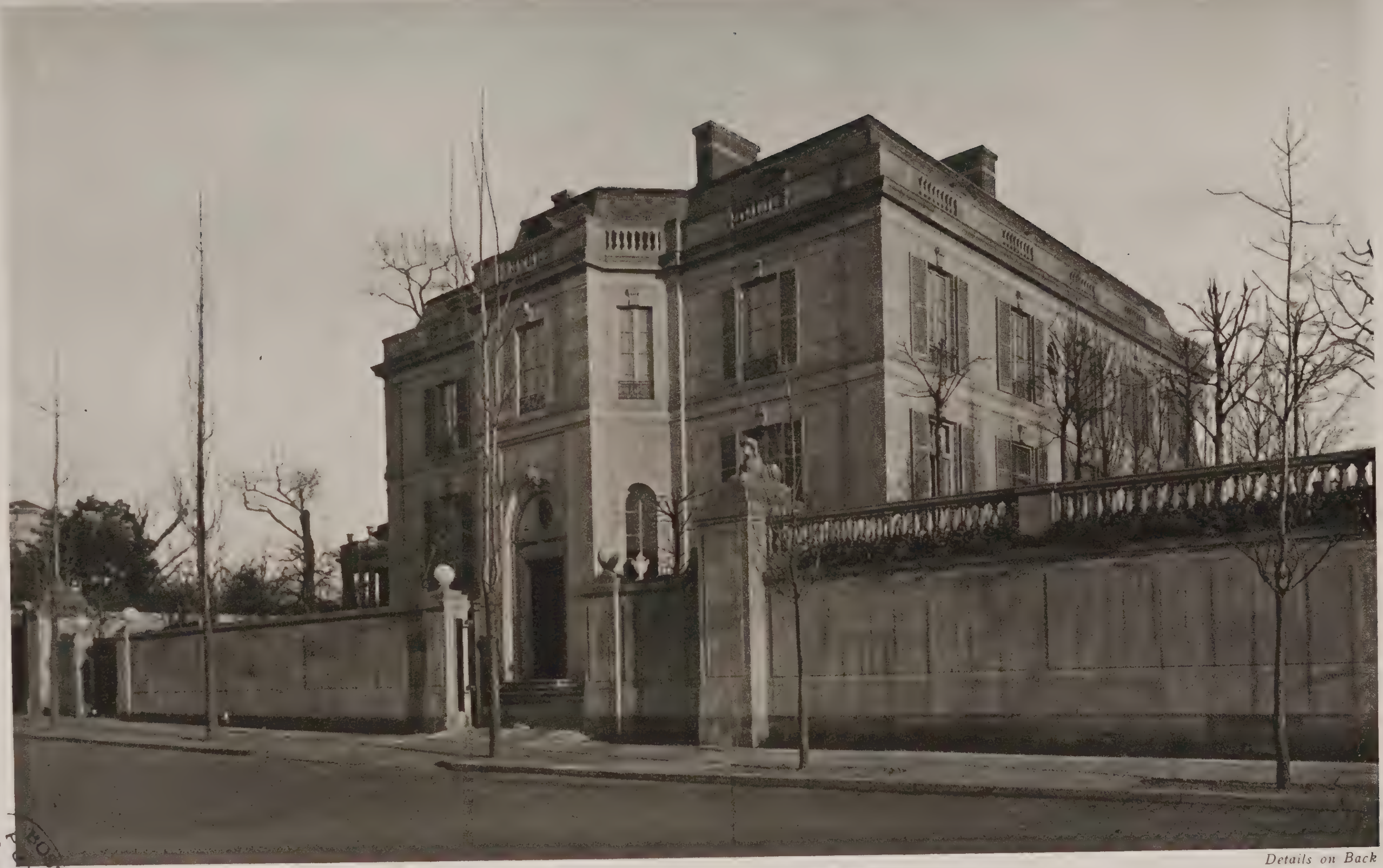
Figures on Church of St. Louis, Villemonble

Concrete tracery will cut out the shadows and provide the high lights which we need in our temperate zone. We need so much window area to admit sufficient light that, in order to provide some restful wall space, the architect must leave the remaining areas undecorated and use the window with its deep shadow and clear outline as a motif. The curvilinear windows in the church at Ulm are a step in the direction of this development. As concrete will harden into any form into which it is poured, it is no longer natural or necessary to have vertical contours for all openings. Bricks, wood, and steel beams are straight elements, and therefore it has been natural to have windows and doors as well as other parts of design rectangular, since introduction of curves necessitated extra cost. In concrete design, curvilinear outlines must become usual, as they are more beautiful. These curtain walls resemble in their function the tympanum of the classical temple and the metopes of Doric friezes; we therefore would be following tradition in covering our concrete wall panels with pictorial tracery. Only a few of the glass panes need be made movable.

As Goethe recognized, evolution follows a spiral curve, returning after a cycle to the starting point, but on a higher level. Use of concrete tracery harks back to the Egyptian tradition of scratching pictures on the early mud or plastered walls. Concrete walls have two points in common with the ancient mud walls of Egypt,—plasticity before setting and the possibility of avoiding projections,—with concrete, a matter of economical centering. On the other hand, ferro-concrete is hard and can carry tension; therefore it can be pierced, and it permits the creation of pictorial silhouettes which are more effective than the incised outlines of wall sculpture as known to Egypt.

Use of concrete tracery will help the architect to fulfill once more his supreme duty,—to create poetry and tell stories in stone,—and to be heard. Concrete tracery with its black and white, eventually even with color, will convey the architect's message, and in a way to compete successfully for attention with the advertisements which are the most conspicuous features of our streets. The true artist always has a message, and concrete tracery will be an effective medium for proclaiming it. The thoughtful architect will have to agree with Ruskin in affirming that the rudest work telling a story or recording a fact is preferable to the richest without meaning.

In case bas-relief as an addition to the simple silhouette effect,—light concrete on dark window glass by day, dark concrete on lit-up window glass at night,—is desired, the sculptor could chisel before the concrete is hard, or without difficulty moulds could be inserted in the main centering.



Details on Back

Photo. Drix Duryea

"MERIDIAN HOUSE," RESIDENCE OF IRWIN LAUGHLIN, ESQ., WASHINGTON
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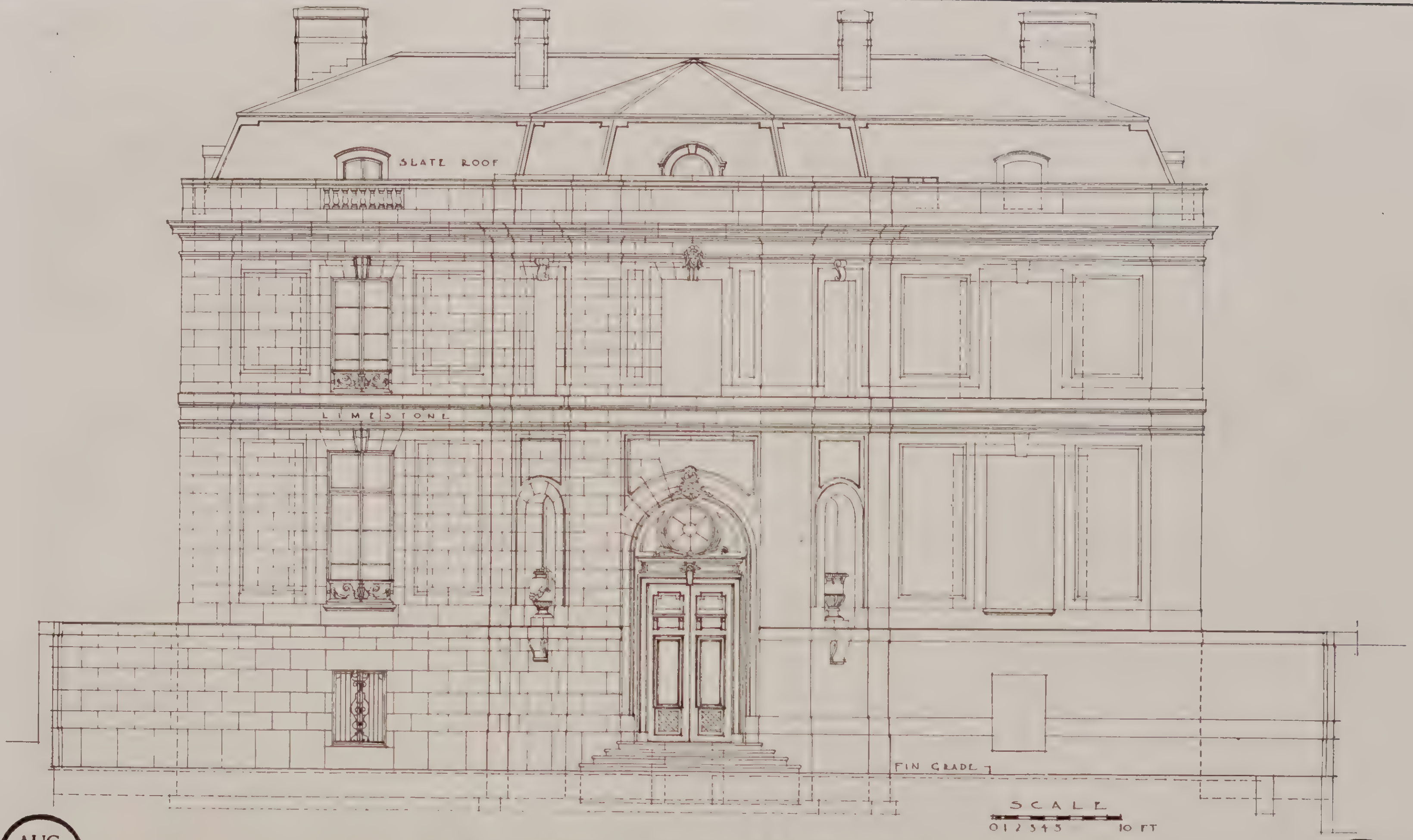

AUG.
1929

No.
4

FRONT ELEVATION

DETAIL, "MERIDIAN HOUSE," RESIDENCE OF IRWIN LAUGHLIN, ESQ., WASHINGTON

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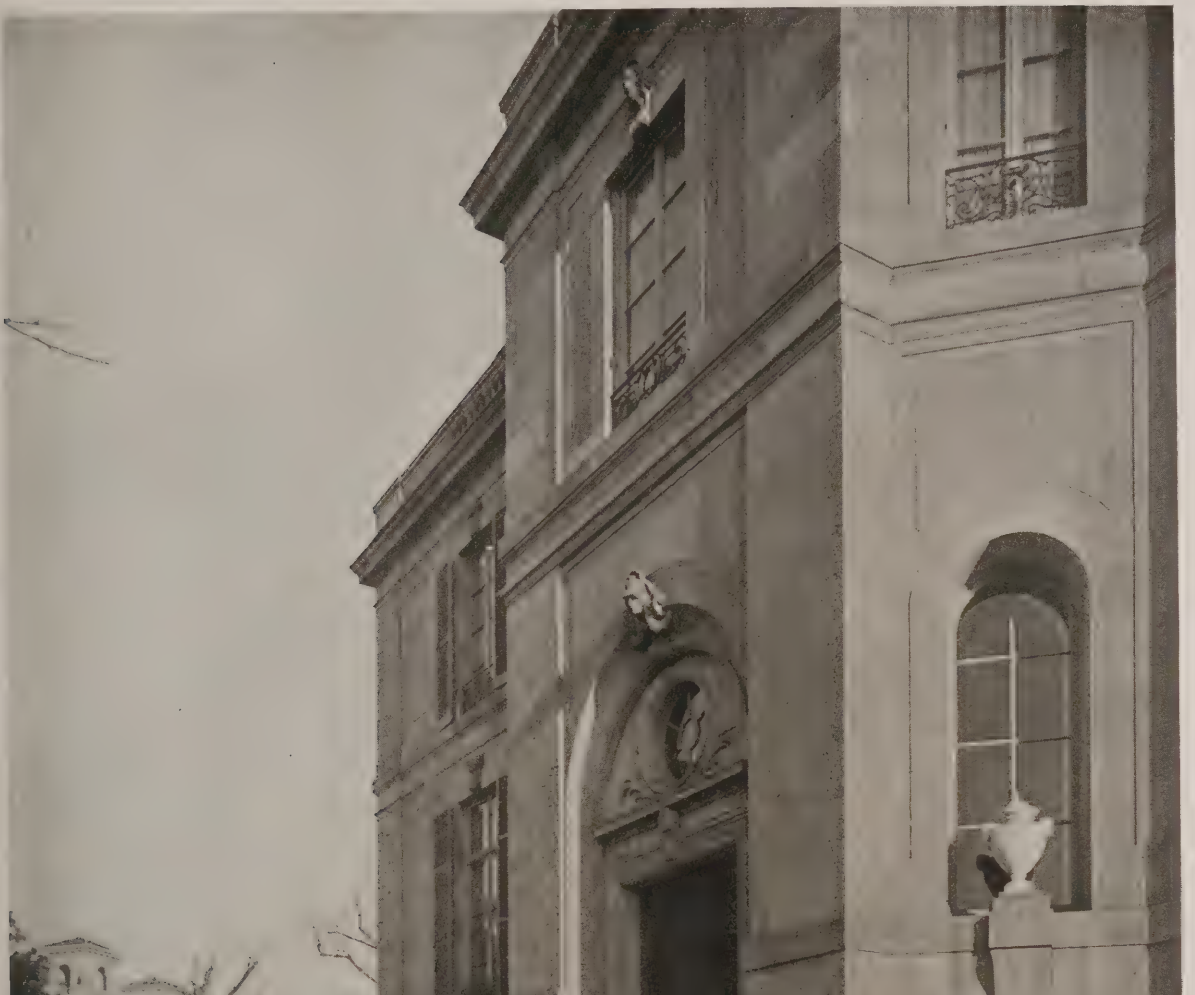
The ARCHITECTURAL FORUM DETAILS



Detail on Back

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MAIN ENTRANCE
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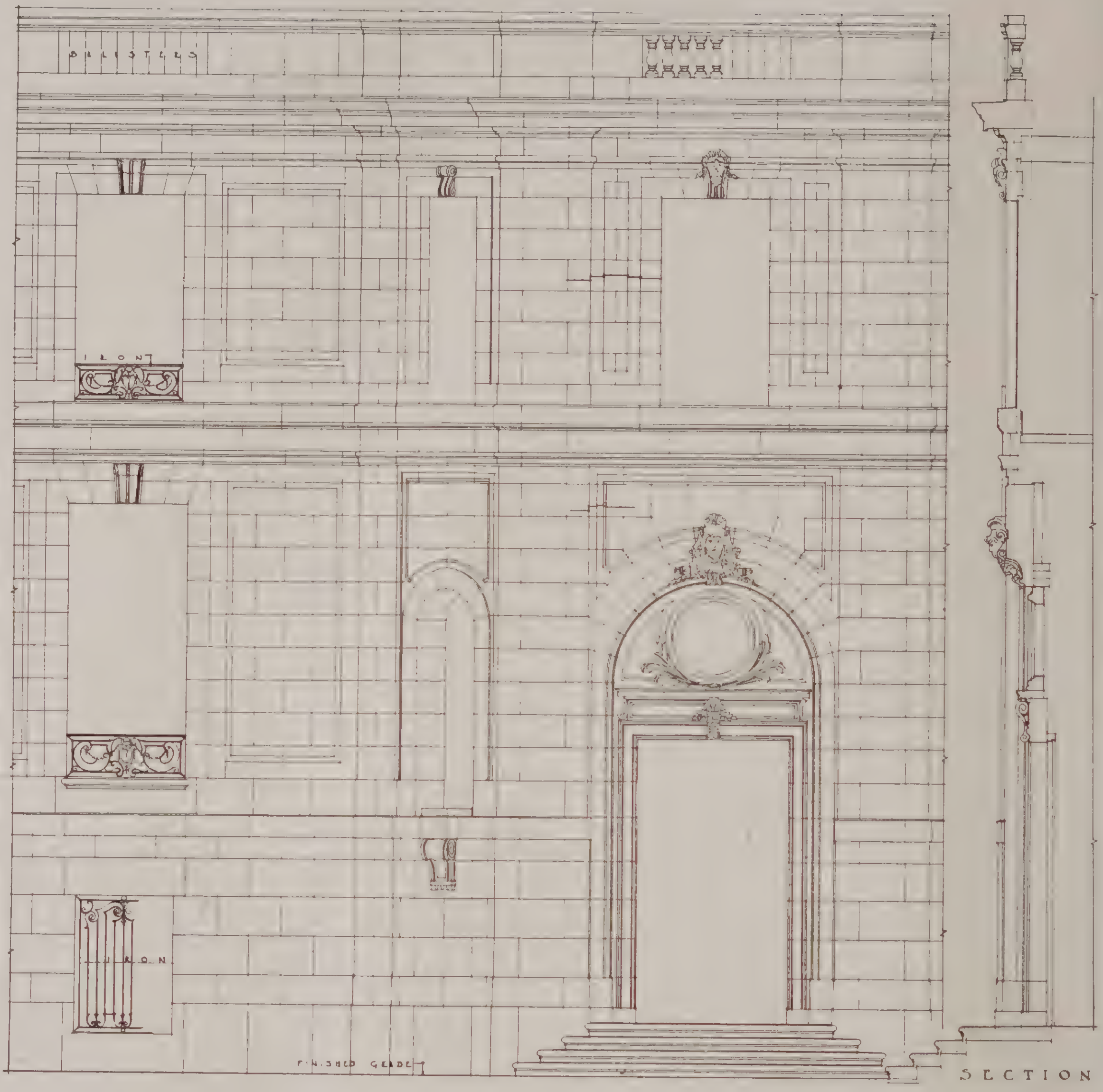

AUG. 1929

EXTERIOR STONE DETAIL

SCALE
0 1 2 3 4 5 FT.

No. 5

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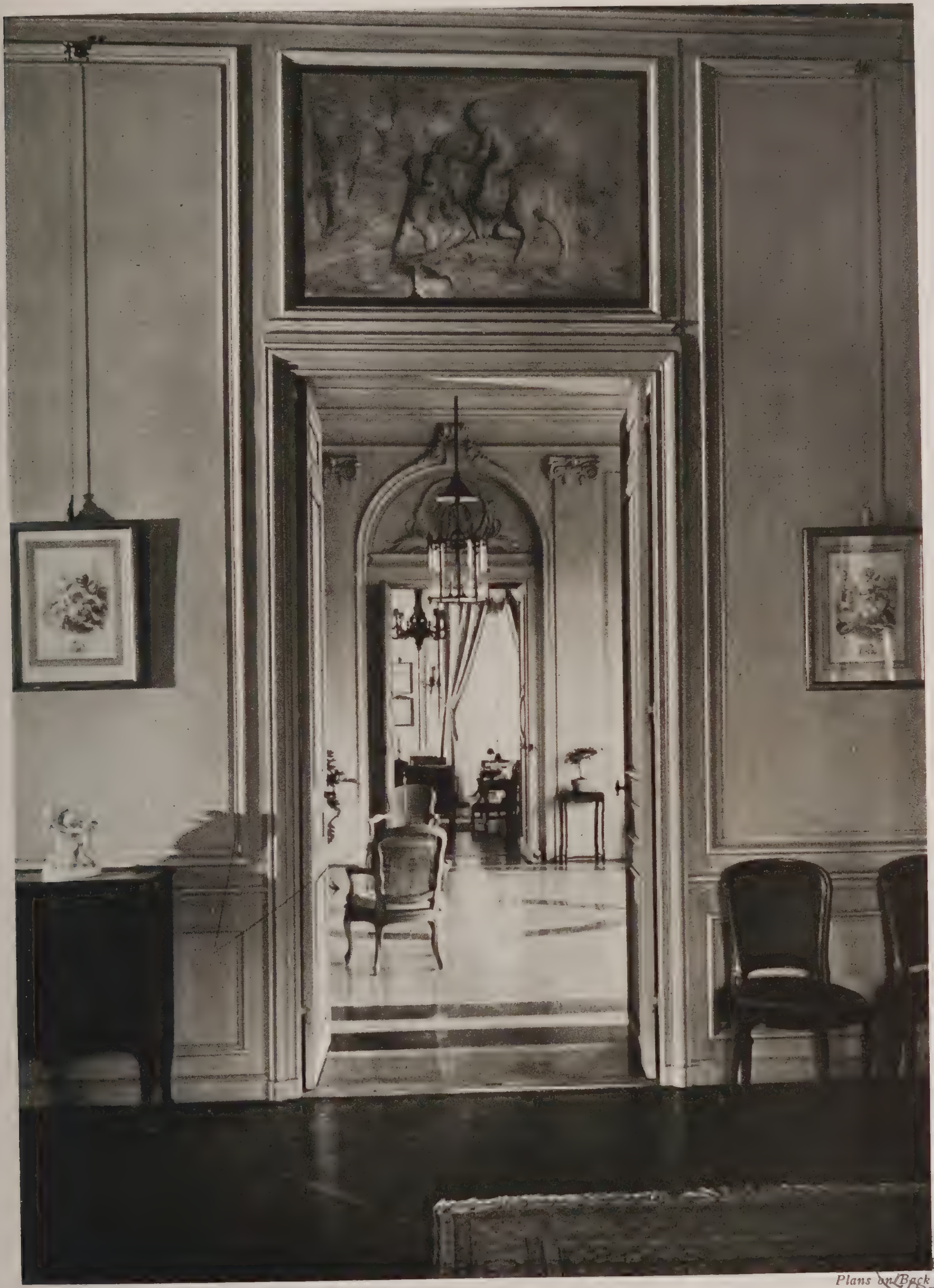
The Architectural Forum Details



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Plans on Back

VIEW FROM DINING ROOM THROUGH LOGGIA INTO DRAWING ROOM
"MERIDIAN HOUSE," RESIDENCE OF IRWIN LAUGHLIN, ESQ., WASHINGTON
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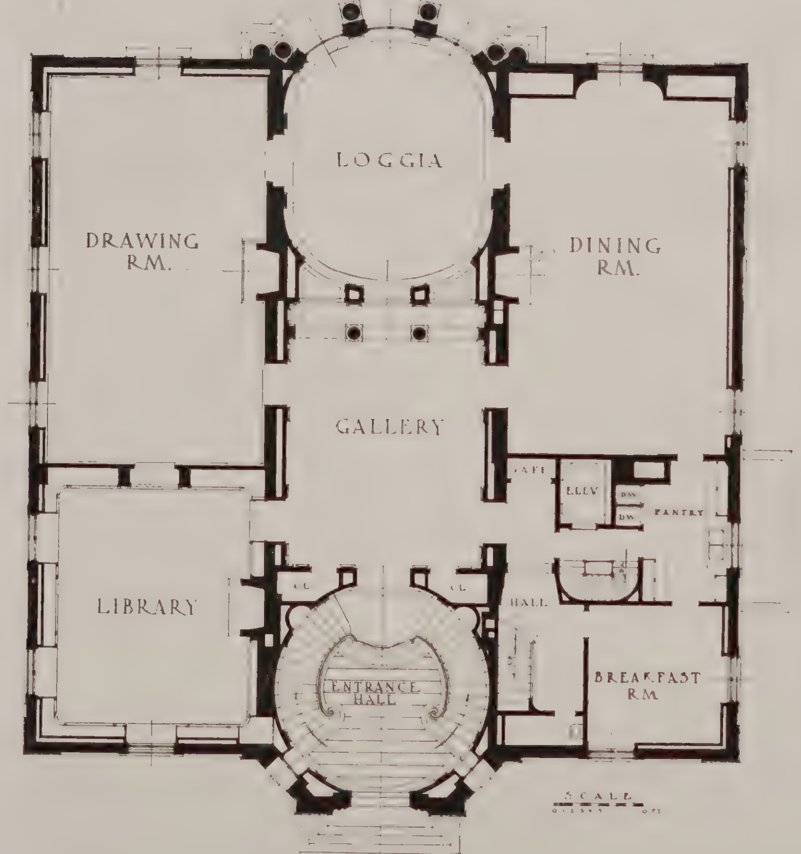
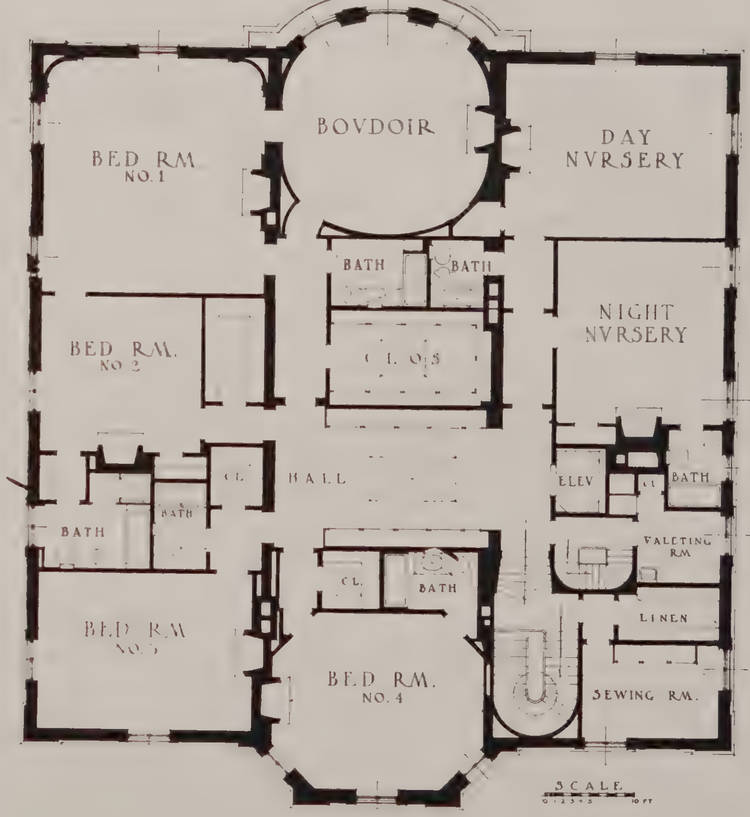


FIRST FLOOR PLAN



SECOND FLOOR PLAN

PLANS. "MERIDIAN HOUSE," RESIDENCE OF IRWIN LAUGHLIN, ESQ., WASHINGTON
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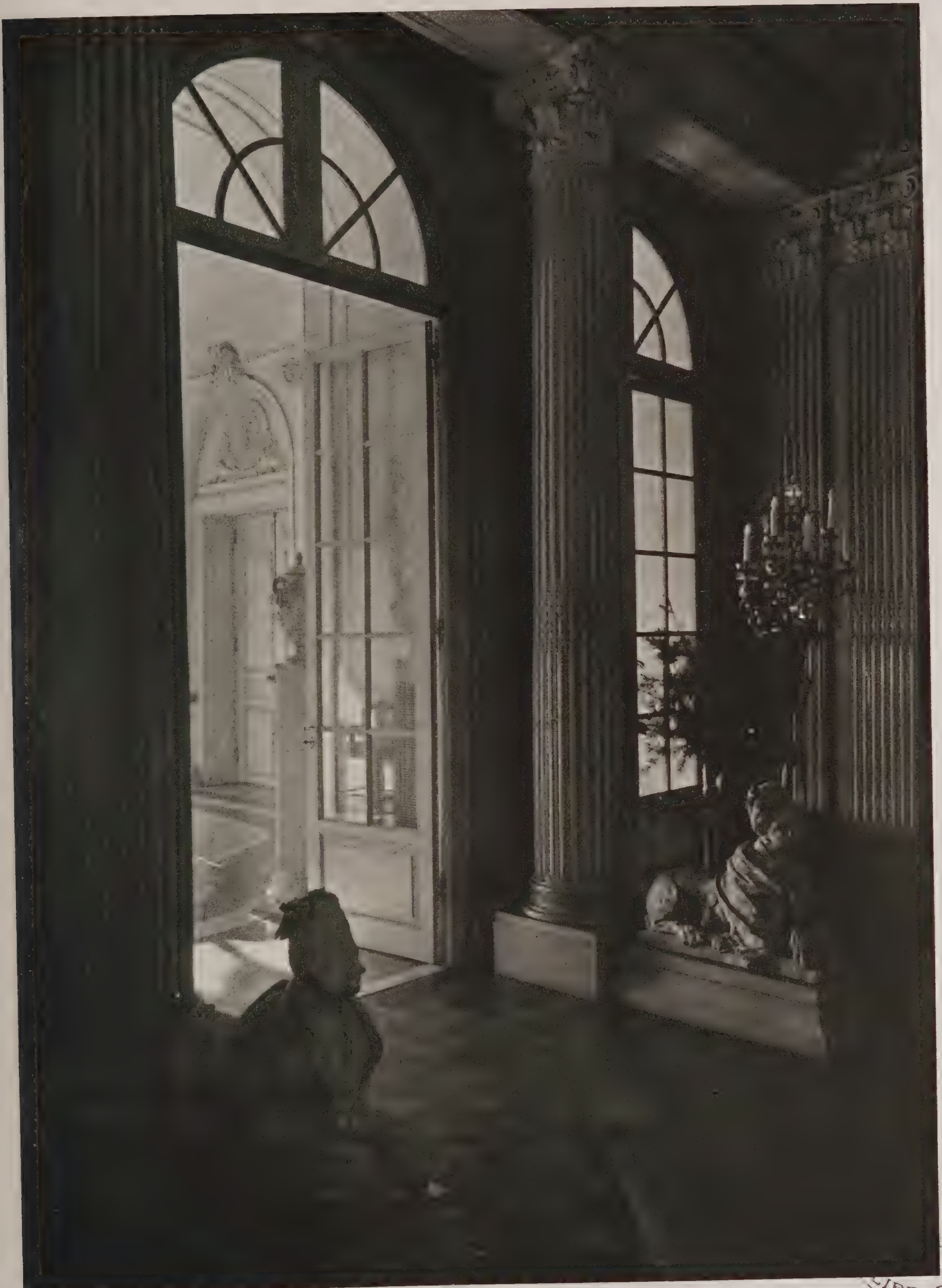

VIEW FROM GALLERY INTO LOGGIA
"MERIDIAN HOUSE," RESIDENCE OF IRWIN LAUGHLIN, ESQ., WASHINGTON
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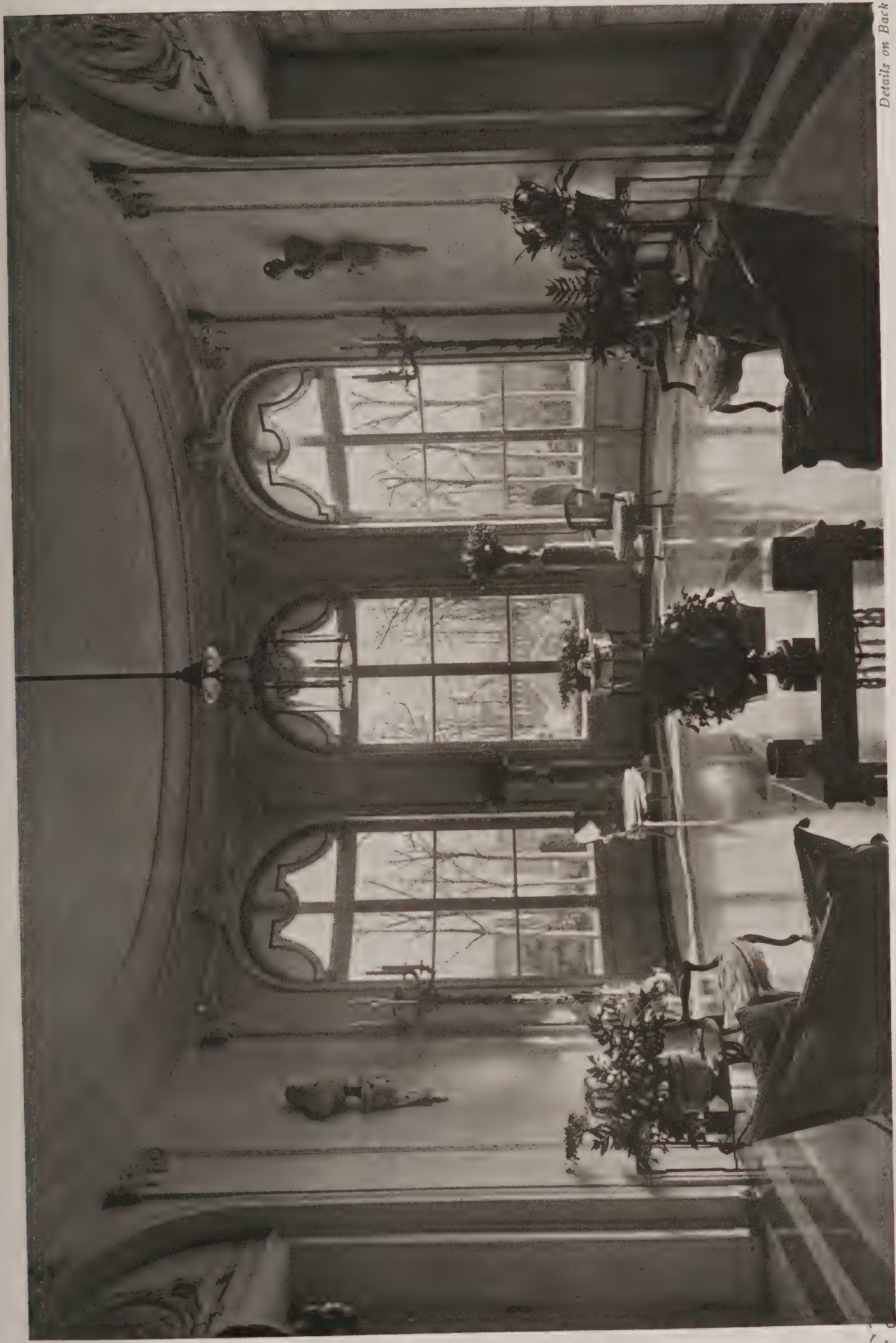

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LOGGIA

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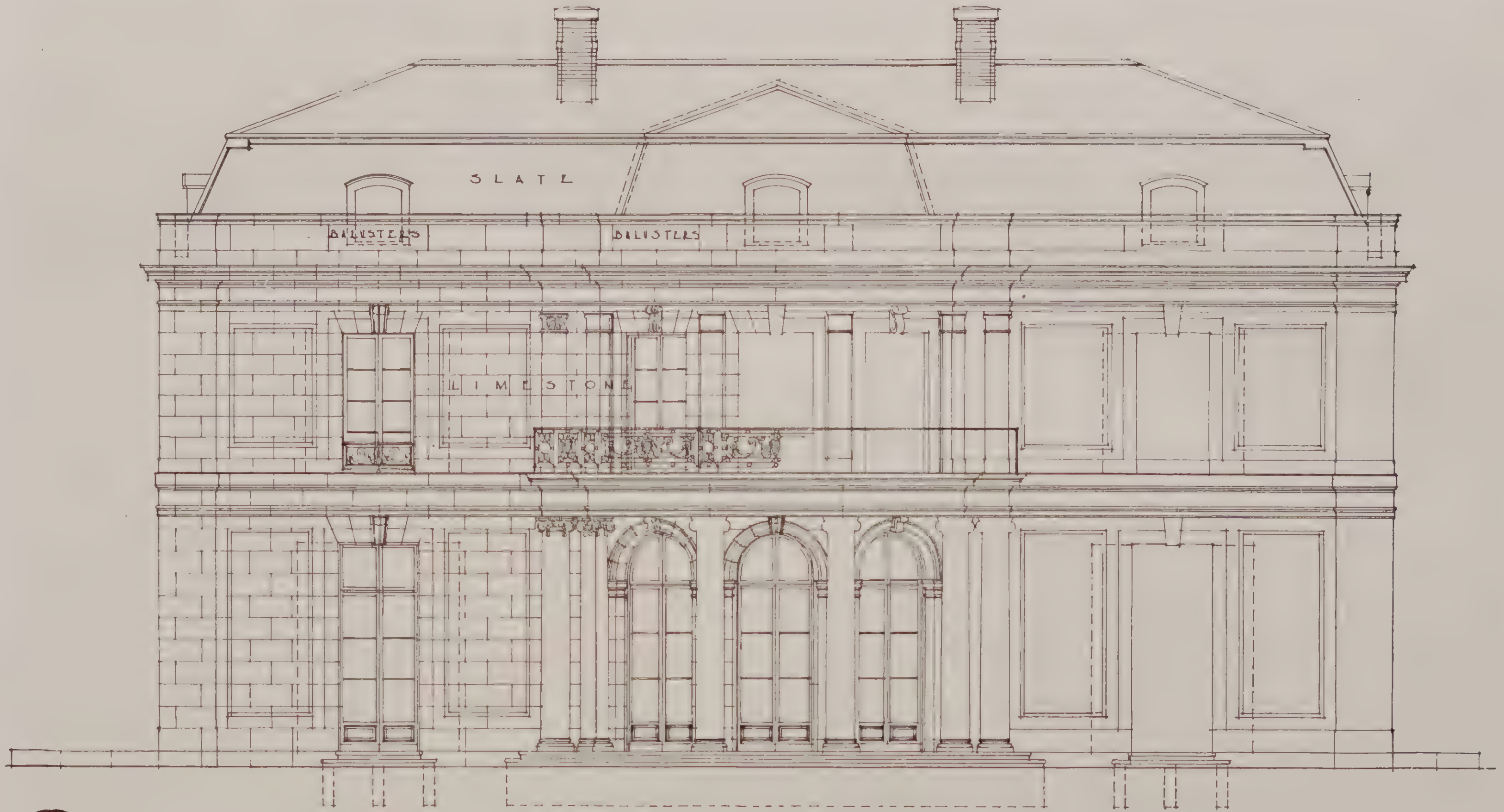

AUG.
1929

No.
6

GARDEN ELEVATION

SCALE
0 1 2 3 4 5 10 FT

DETAIL, "MERIDIAN HOUSE," RESIDENCE OF IRWIN LAUGHLIN, ESQ., WASHINGTON
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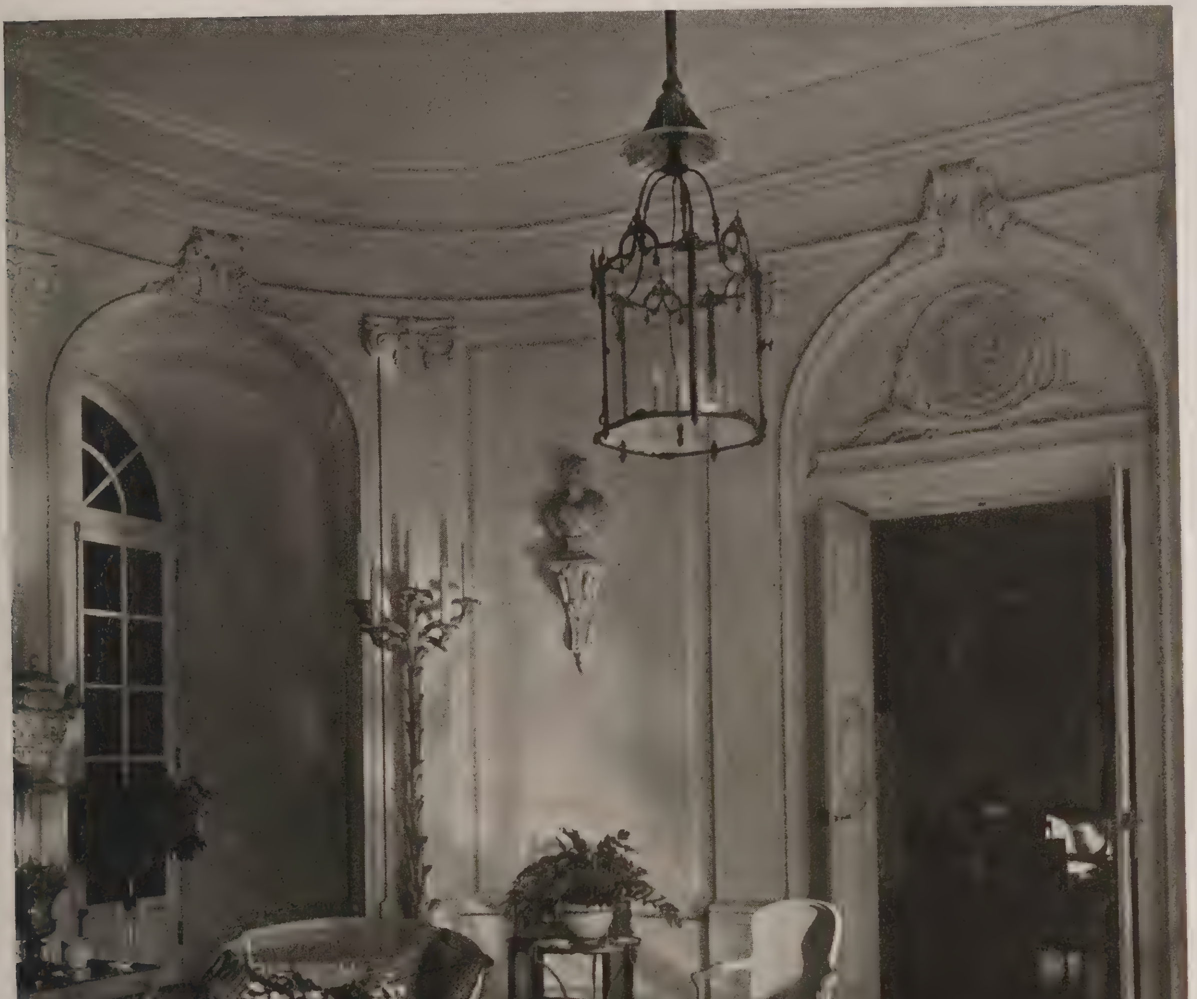
The Architectural Forum Details



LOGGIA

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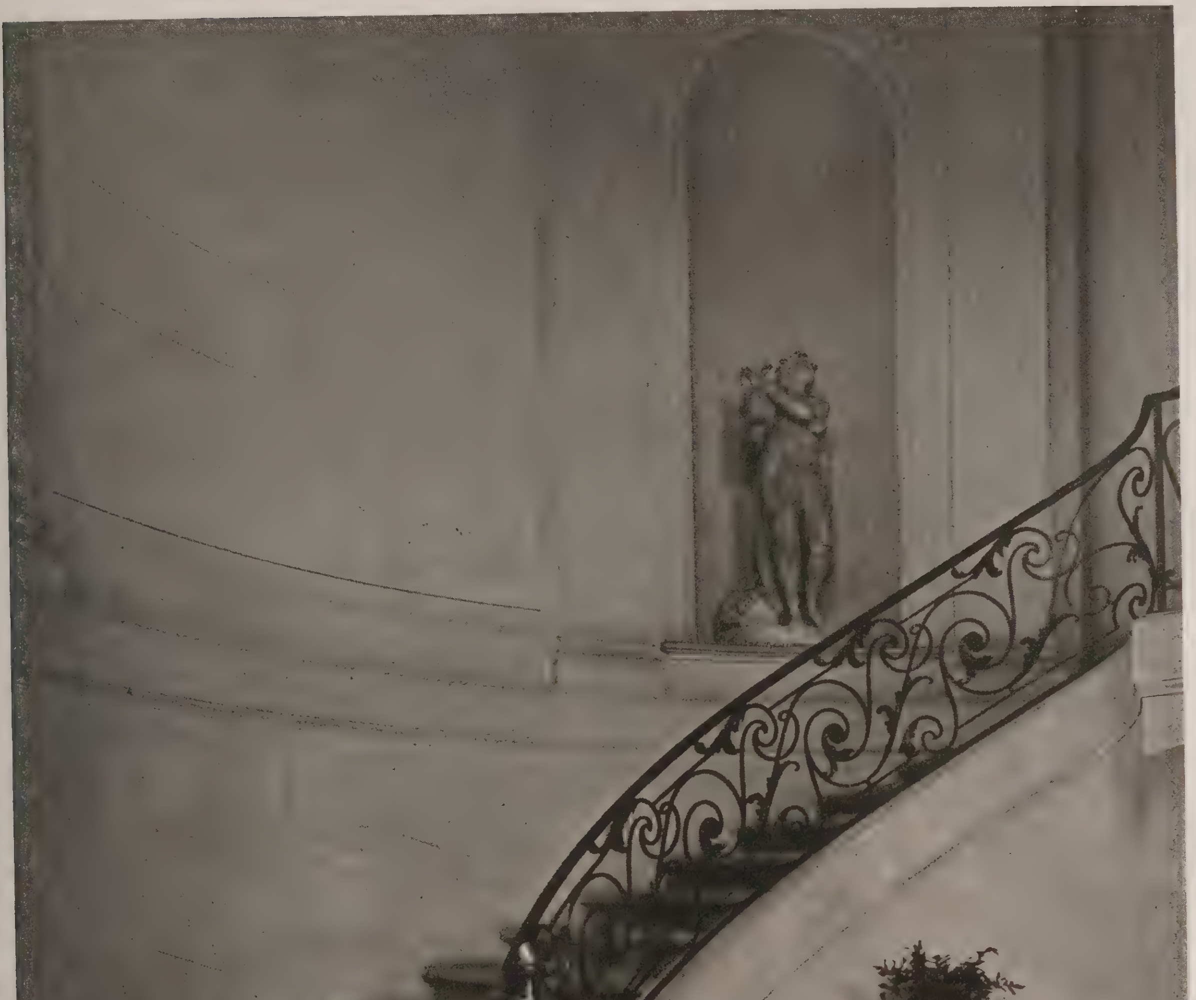

MAIN STAIRWAY
"MERIDIAN HOUSE," RESIDENCE OF IRWIN LAUGHLIN, ESQ., WASHINGTON
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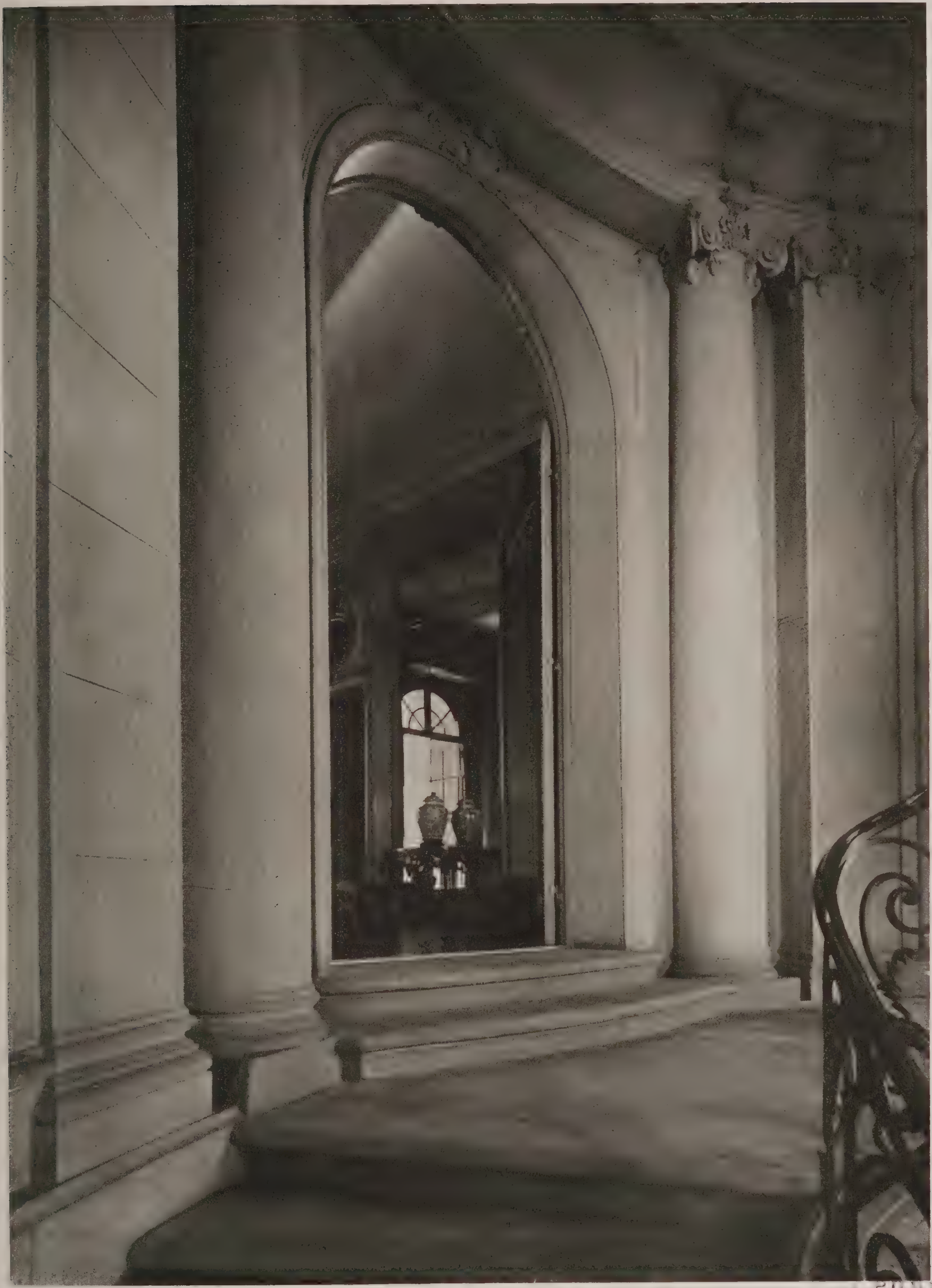

MAIN STAIRWAY LANDING
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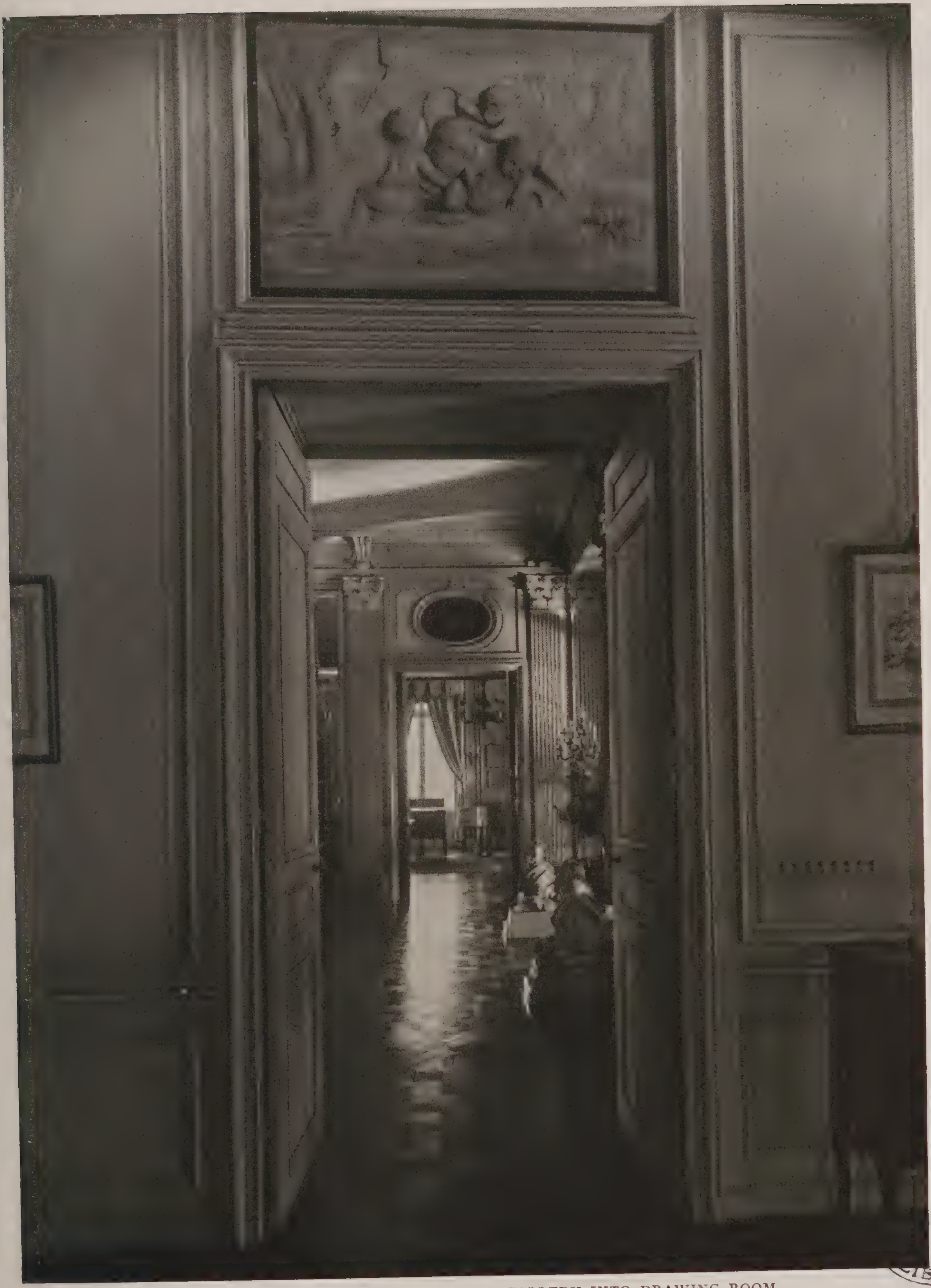

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VIEW FROM DINING ROOM THROUGH GALLERY INTO DRAWING ROOM
"MERIDIAN HOUSE," RESIDENCE OF IRWIN LAUGHLIN, ESQ., WASHINGTON
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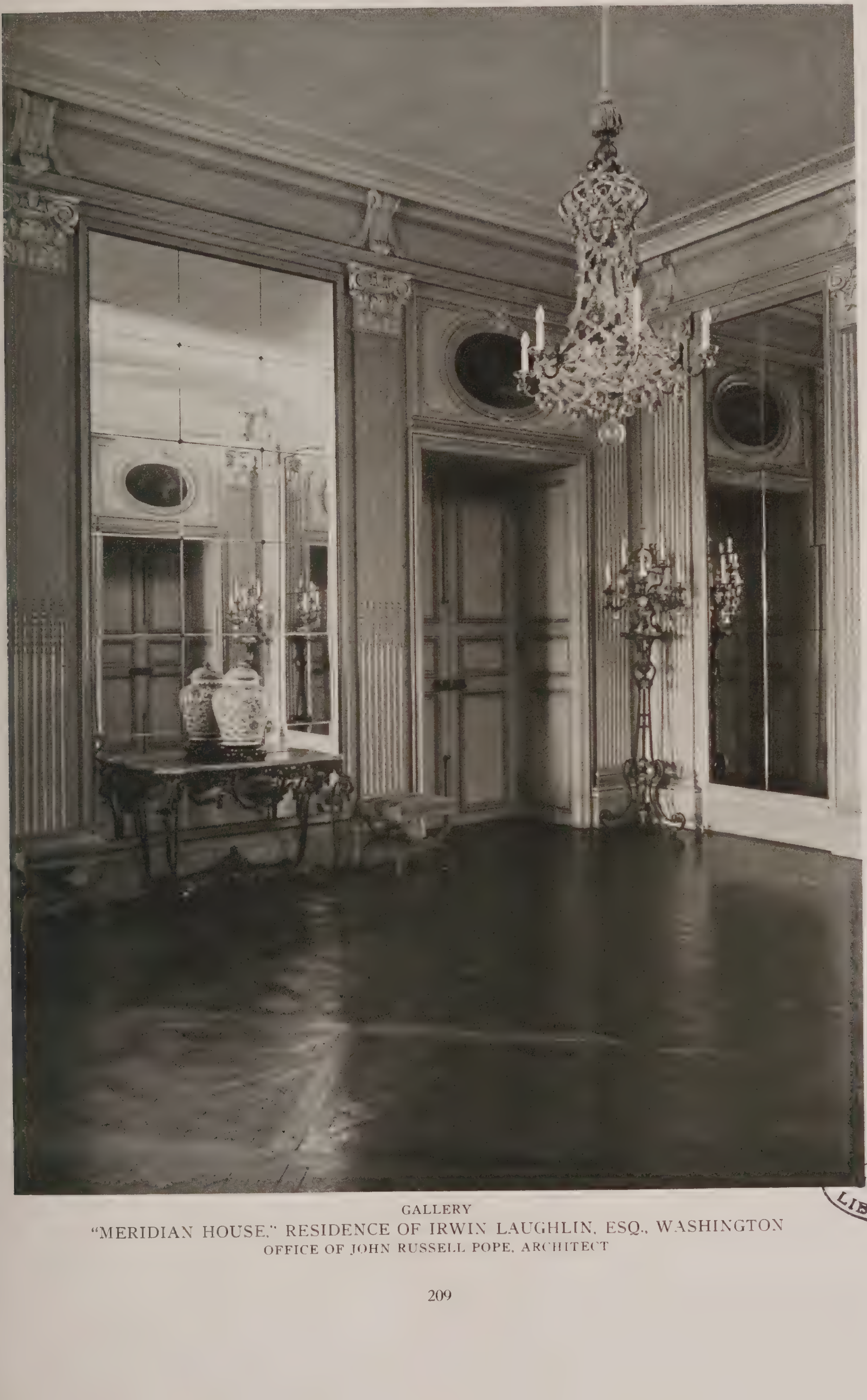

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GALLERY
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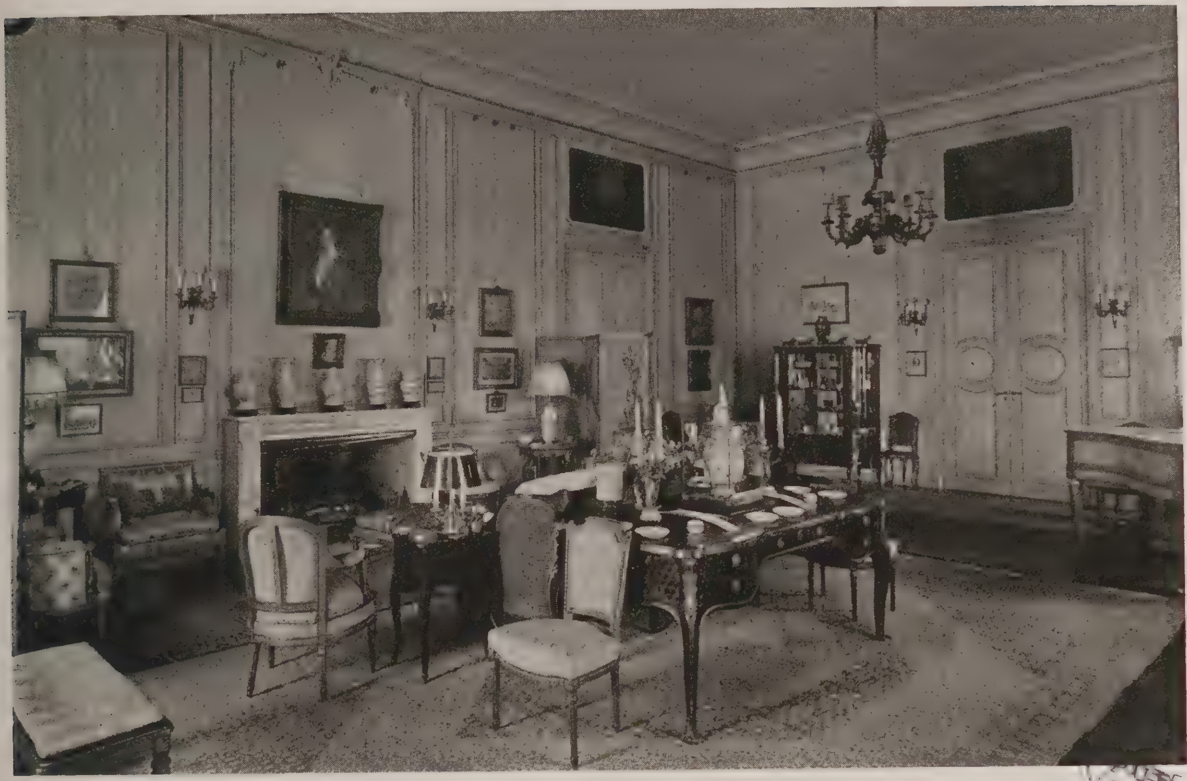

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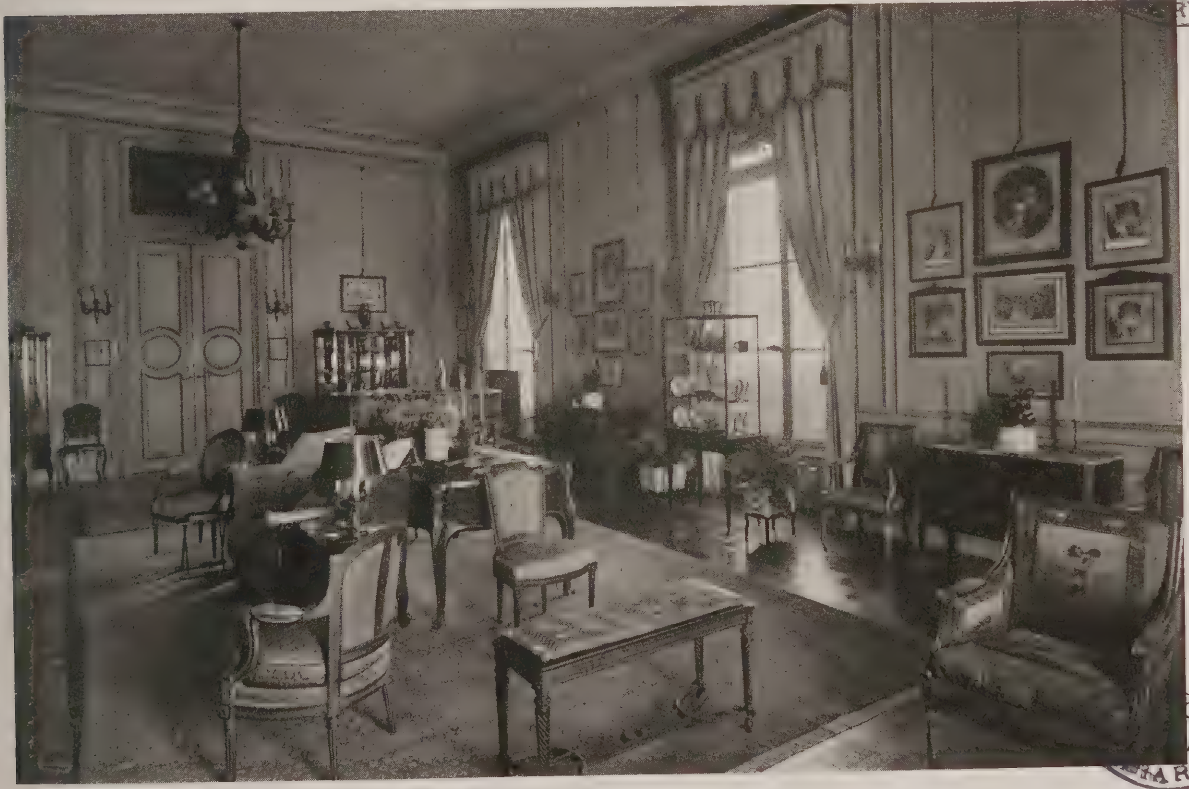

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TWO VIEWS OF THE DRAWING ROOM
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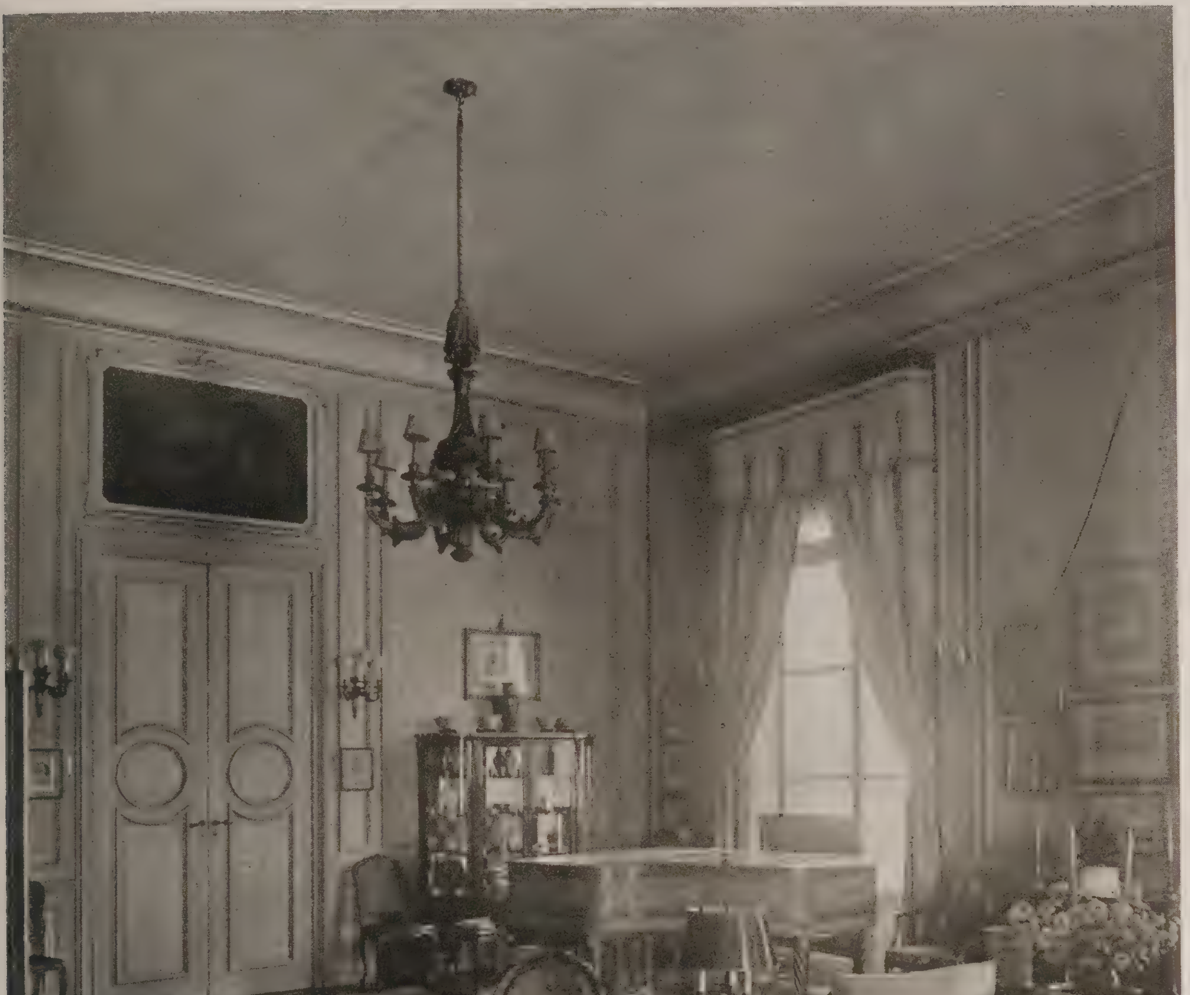

DRAWING ROOM
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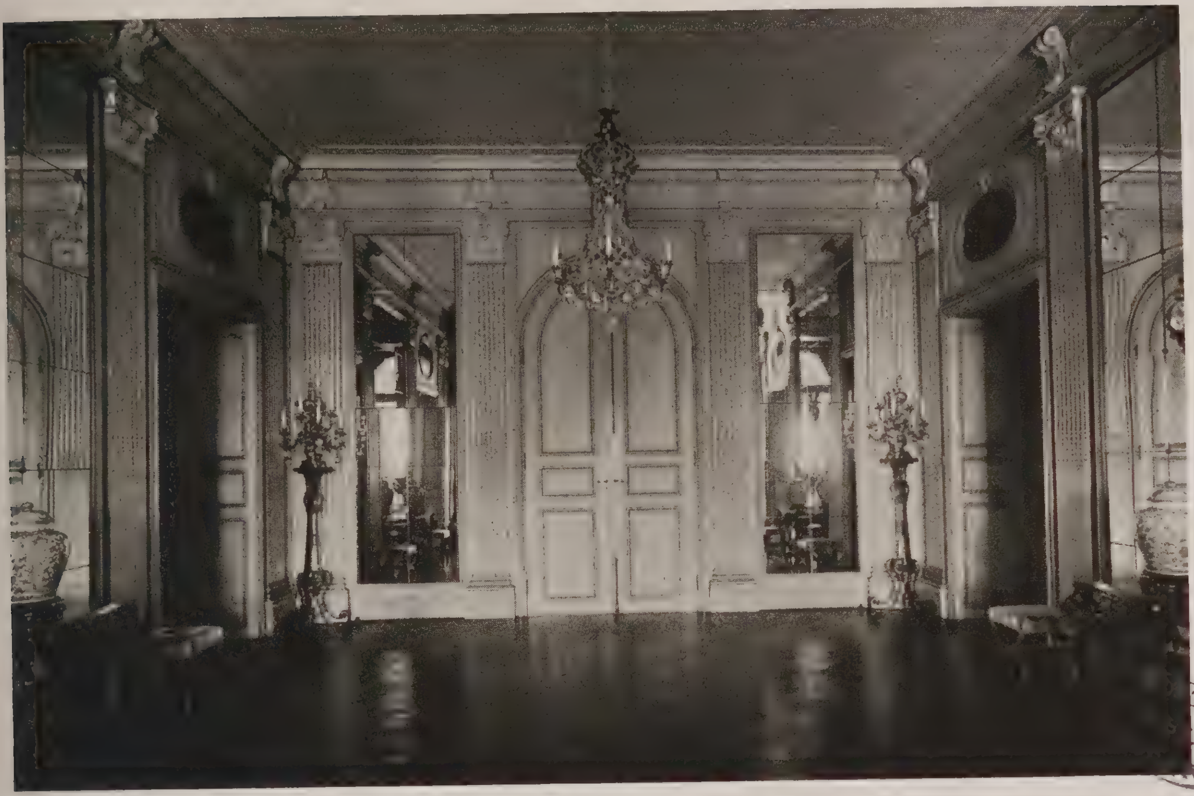

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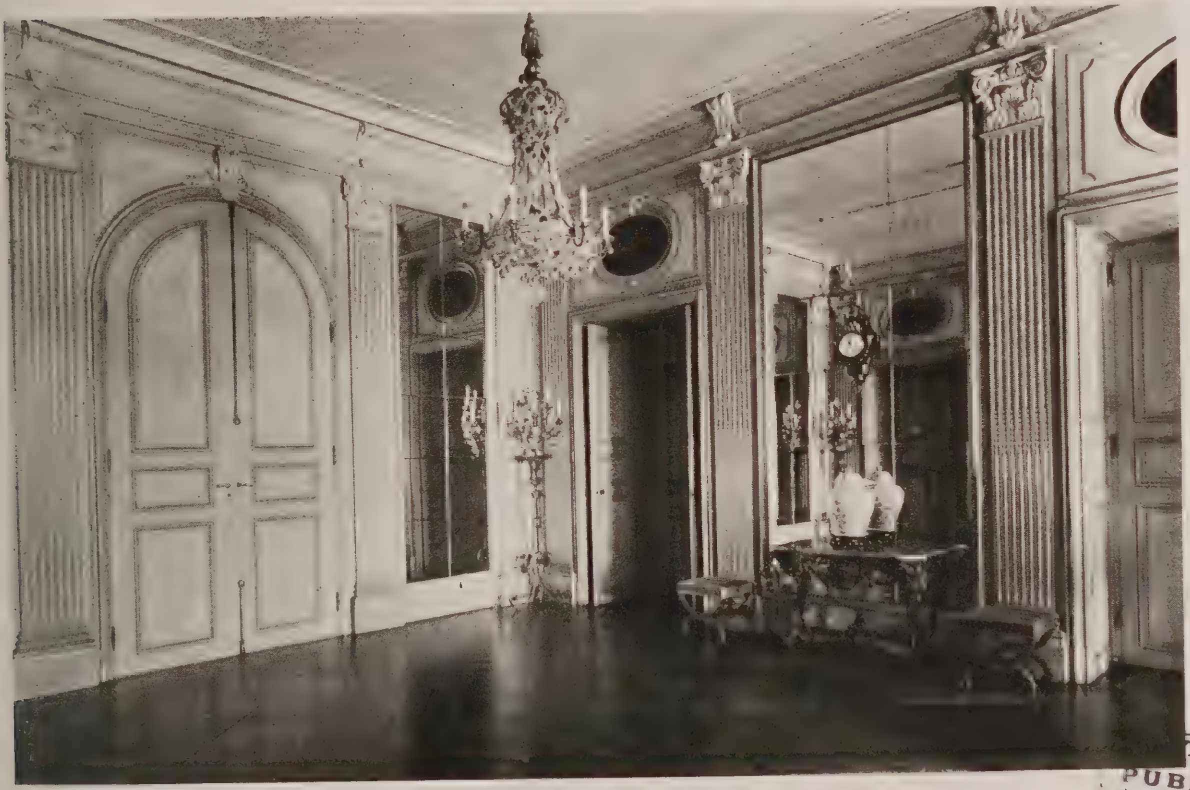

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TWO VIEWS OF THE GALLERY
"MERIDIAN HOUSE," RESIDENCE OF IRWIN LAUGHLIN, ESQ., WASHINGTON
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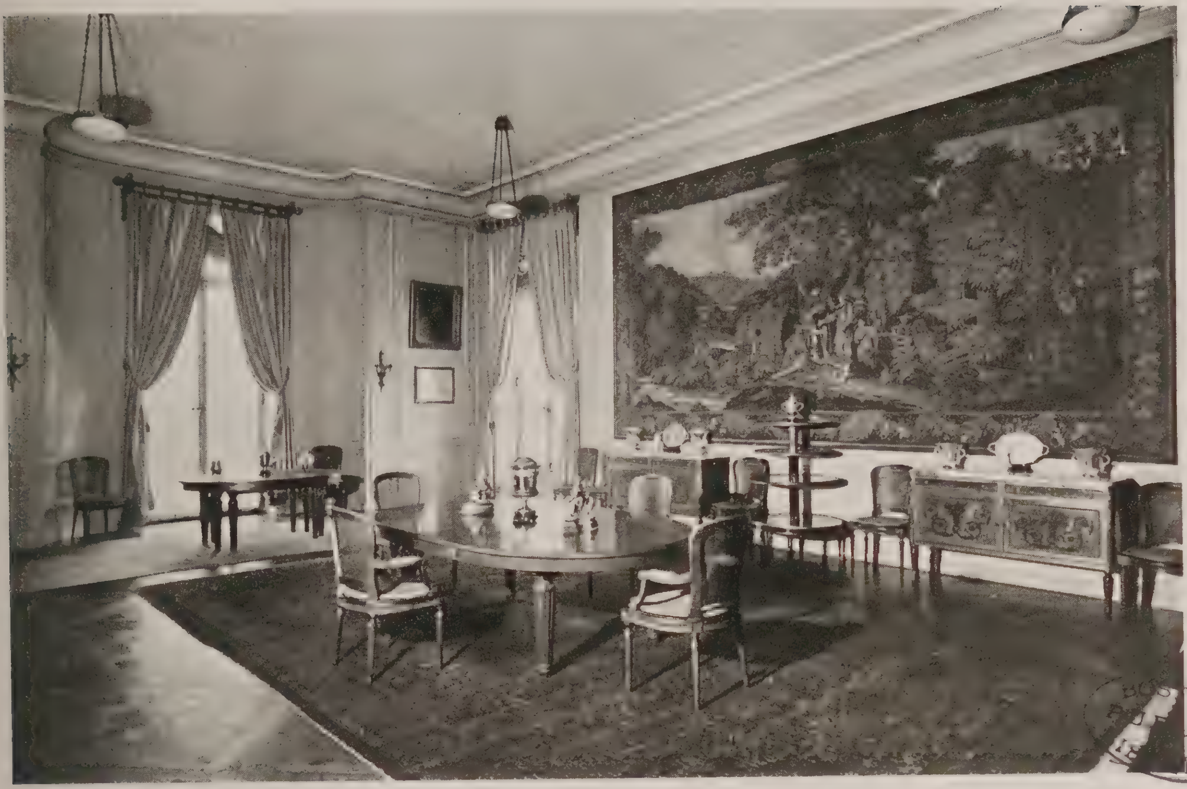

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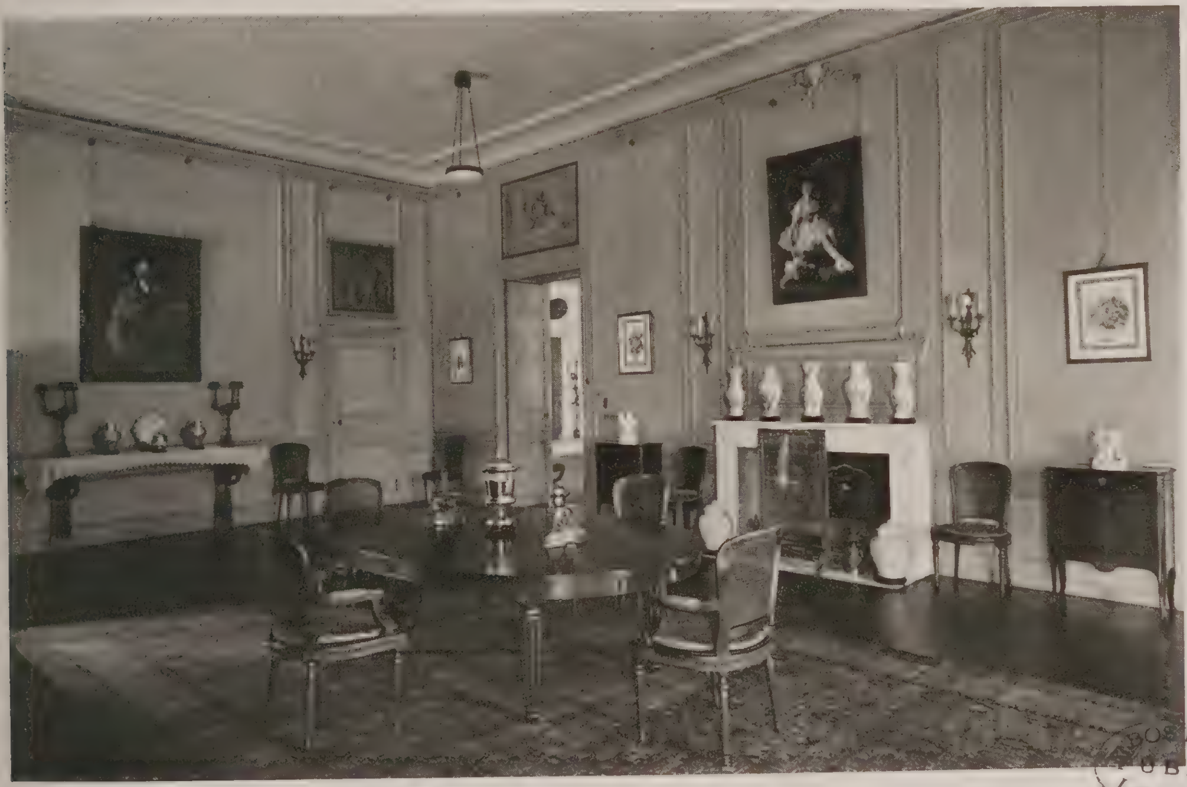

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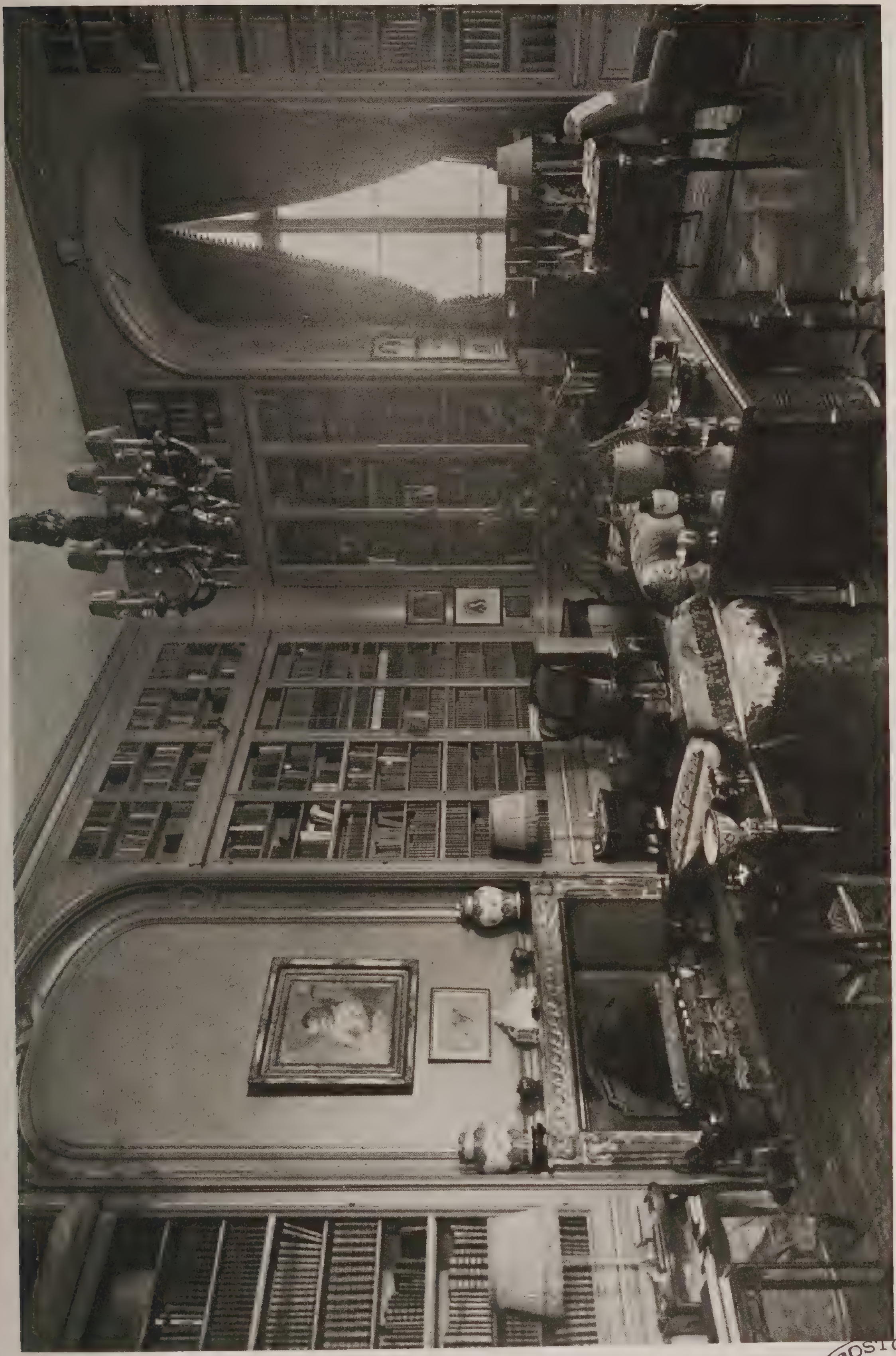

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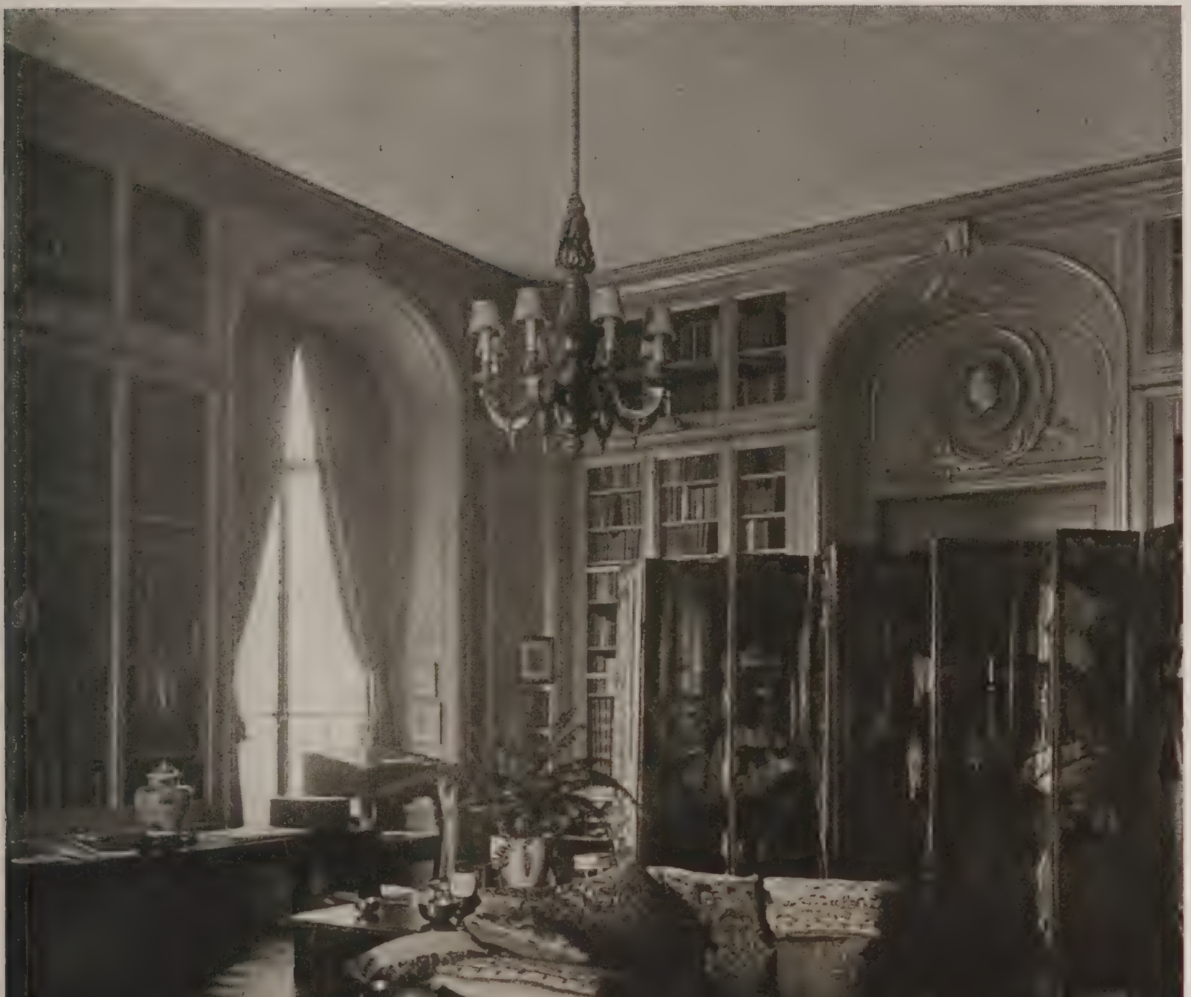

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"MERIDIAN HOUSE," RESIDENCE OF IRWIN LAUGHLIN, ESQ., WASHINGTON

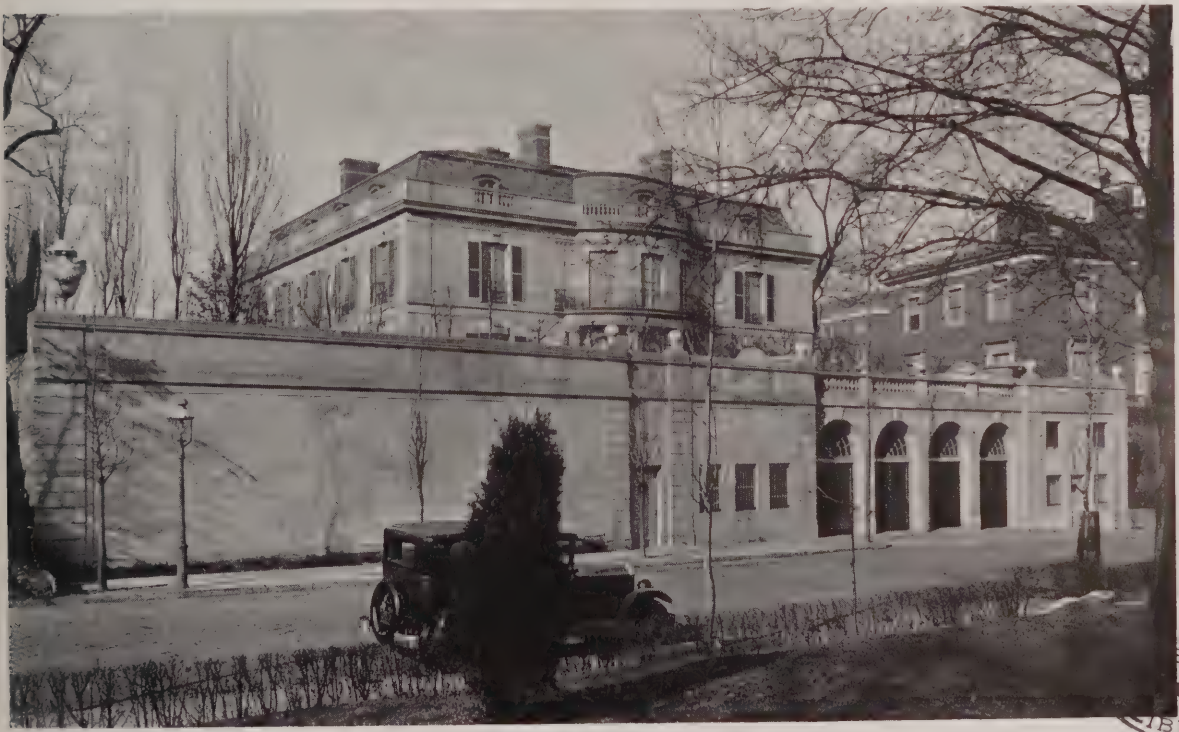
BY

MATLACK PRICE

NOW that much of the architectural thought of this country is preoccupied with new architectural ideas, with expressions variously called "modern" or twentieth century, it may well be that we shall set up new standards in our renderings of historic styles. Such new standards would, necessarily, have to do with degrees of perfection. Ever since it became the architectural fashion to adapt European styles, this has been done very thoroughly, and in a complete range not only of origins but of merit. American architects have adapted historic styles as badly and as well as it is imaginably possible for adaptation to go,—but if we are to suppose this era to be nearing its close, have we not so come of age æsthetically that we can demand only the very finest work? It has always seemed to me a futile business to work in a borrowed style without interpreting it at least as well as those who originated it. Our task is not, inherently, so difficult. We have the best things they did to serve us as models and standards.

It would not be wise to say that any one style of the historic periods is more easy or more difficult to adapt, today, than any other. Or that the flair of any architect for adapting one style surpasses, necessarily his flair for adapting another. This concerns itself more vitally with good taste, which is not to be had from books. It is true that many architects have become known, and justly, for their achievements in one historic style. As thoroughgoing an architect as John Russell Pope does a Georgian Adam house as finely as the Hitt house in Washington, a Tudor house as well as the Duncan house in Newport, and an eighteenth century French house as finely as the Laughlin house in Washington. But there are not many such architects; if there were, there would be more really distinguished houses designed in the historic styles.

Certainly our achitecture has reached the point where the period adaptation needs to be thoroughly done or let alone. We cannot, indefinitely, have much patience with pretentious houses, whether they are English, French or Italian, unless they show a high degree of good taste on the part of the architect. There have been plenty of French houses in this country, but not many which have been really fine. This house for Irwin Laughlin, from the office of John Russell



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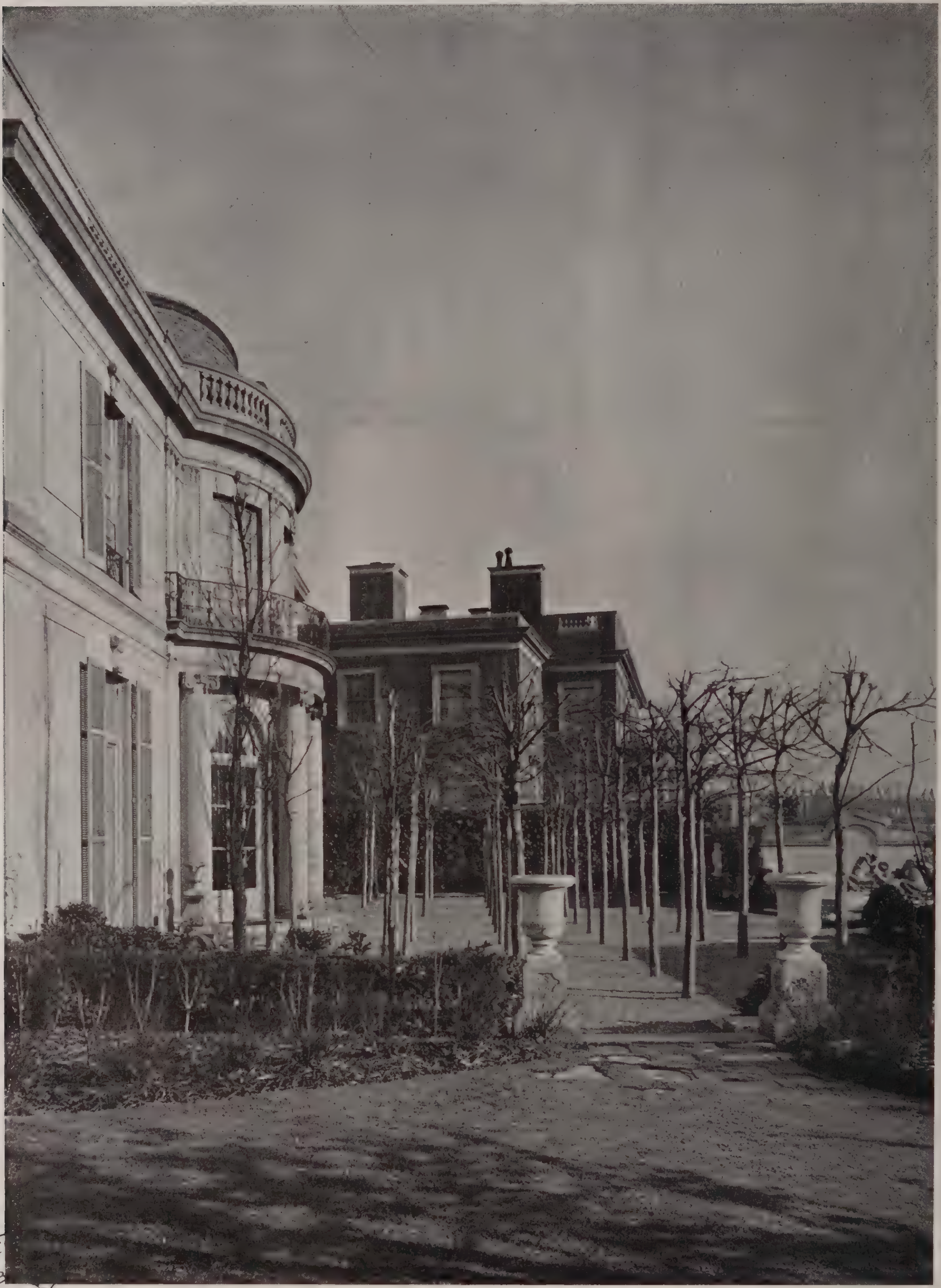
Belmont Place Facade



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THE TERRACE GARDEN
"MERIDIAN HOUSE," RESIDENCE OF IRWIN LAUGHLIN, ESQ., WASHINGTON
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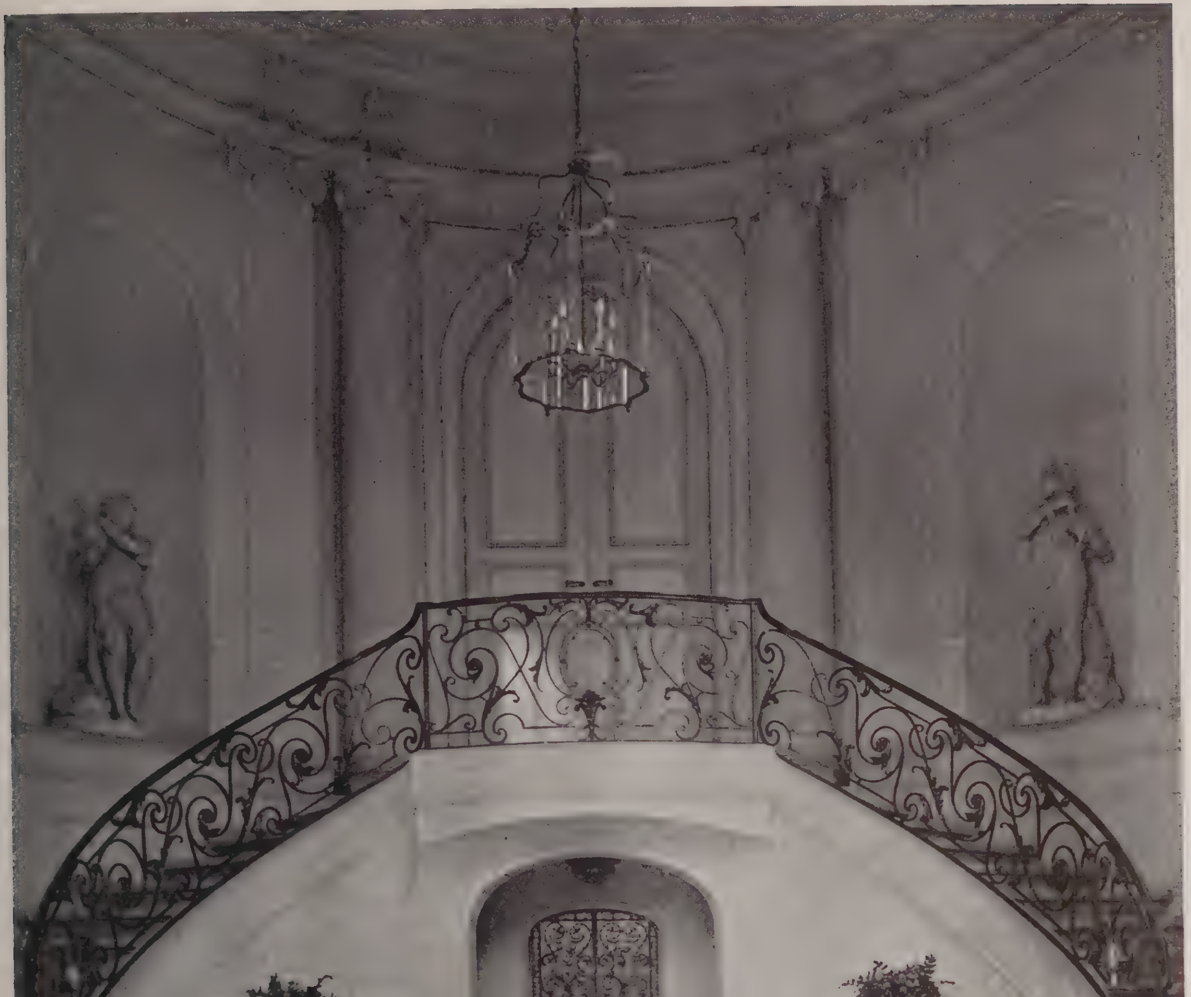

ENTRANCE HALL
"MERIDIAN HOUSE," RESIDENCE OF IRWIN LAUGHLIN, ESQ., WASHINGTON
OFFICE OF JOHN RUSSELL POPE, ARCHITECT

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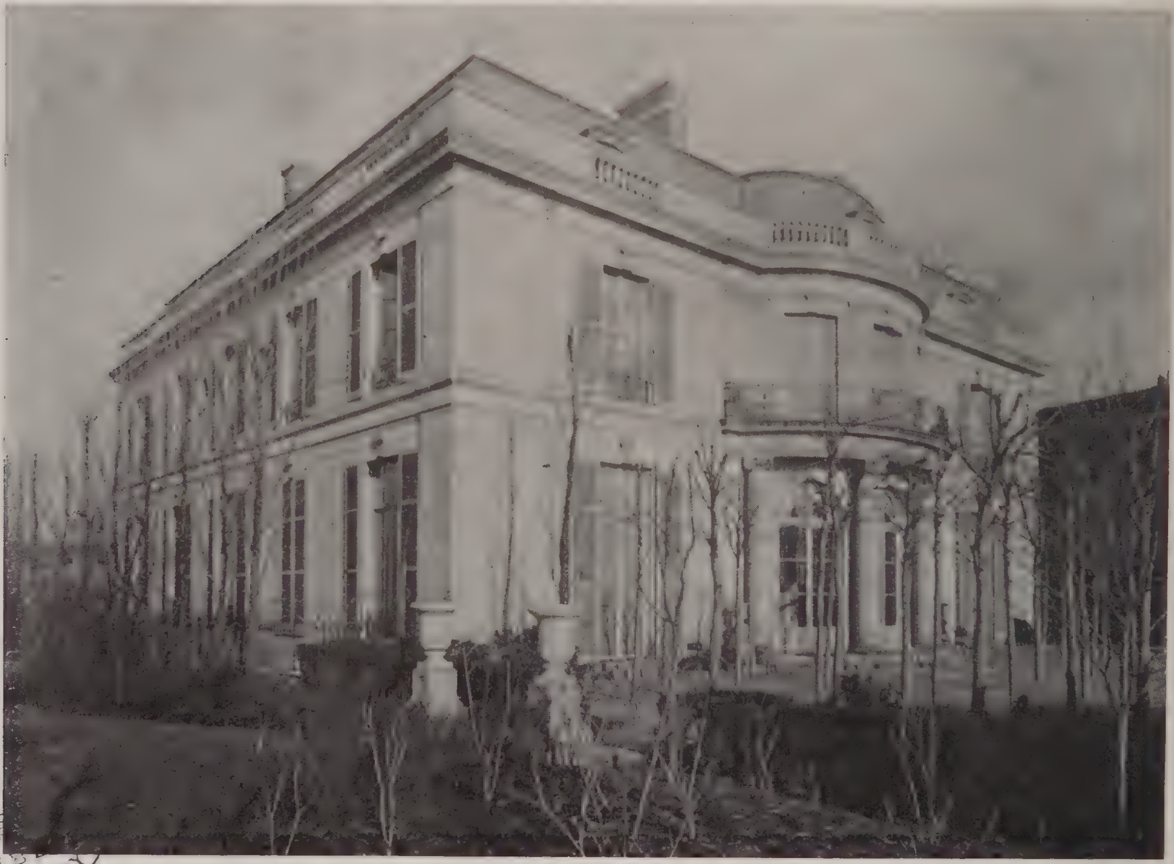
Pope, is perhaps as fine a piece of work of its kind as this country can show. The French manner here has worn several period costumes,—especially in town houses. And there have been more chateaux in the way of country houses, or houses detached, than houses such as this by Mr. Pope. "Biltmore," in North Carolina, is still a fine thing of its kind, and two of the Vanderbilt houses in New York, Francis I in manner, will always be missed. It is a pity that Fifth Avenue was so in need of improvement that these had to be demolished. Most other French houses in New York were done in what was, at the time of their building, "modern" French architecture, that is, the profusely detailed and over-detailed manner that was being taught at the Beaux Arts. The recently demolished residence of the late Senator Clark was a not too unfair example.

More nearly in character with the house here illustrated are such houses as the Gambrill and Berwind houses in Newport, though even these have not the restraint of the Laughlin house. And such examples as the Stotesbury house outside Philadelphia have been effective mainly in their reënacting the Grand Manner. To re-create the really chaste phase of the Style Louis XVI is quite another matter, and one comparable in difficulty only with an authentic rendering of the style of the brothers Adam. Even to an eye architecturally untrained there must be, in the Laughlin house, a feeling of authority, of an inescapable finesse in its very corners,—so finely sharp in its every moulding, so incredibly restrained. A high wall partly masks its entrance, with a very stylized sphinx flanking the terrace balustrade at its abutment to the right of the shallow forecourt. Even in mass the house has a delicate nicety, to the slate mansard behind its balustraded parapet. The chimneys are as finely proportioned as a French mantel clock, and every exterior moulding is so perfectly scaled to the whole building as to suggest the nicety of a piece of furniture of the period. It seems to be an exterior (and how rare they are!) free from architectural regrets. Here is an exemplar of good taste,—an achievement not only in architectural manner but manners so sure that even the possibility of a *faux pas* is not to be conceded; faultless architectural diction; an architectural *beau geste* even in a style of which the essence was the



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South Facade

"Meridian House," Residence of Irwin Laughlin, Esq., Washington

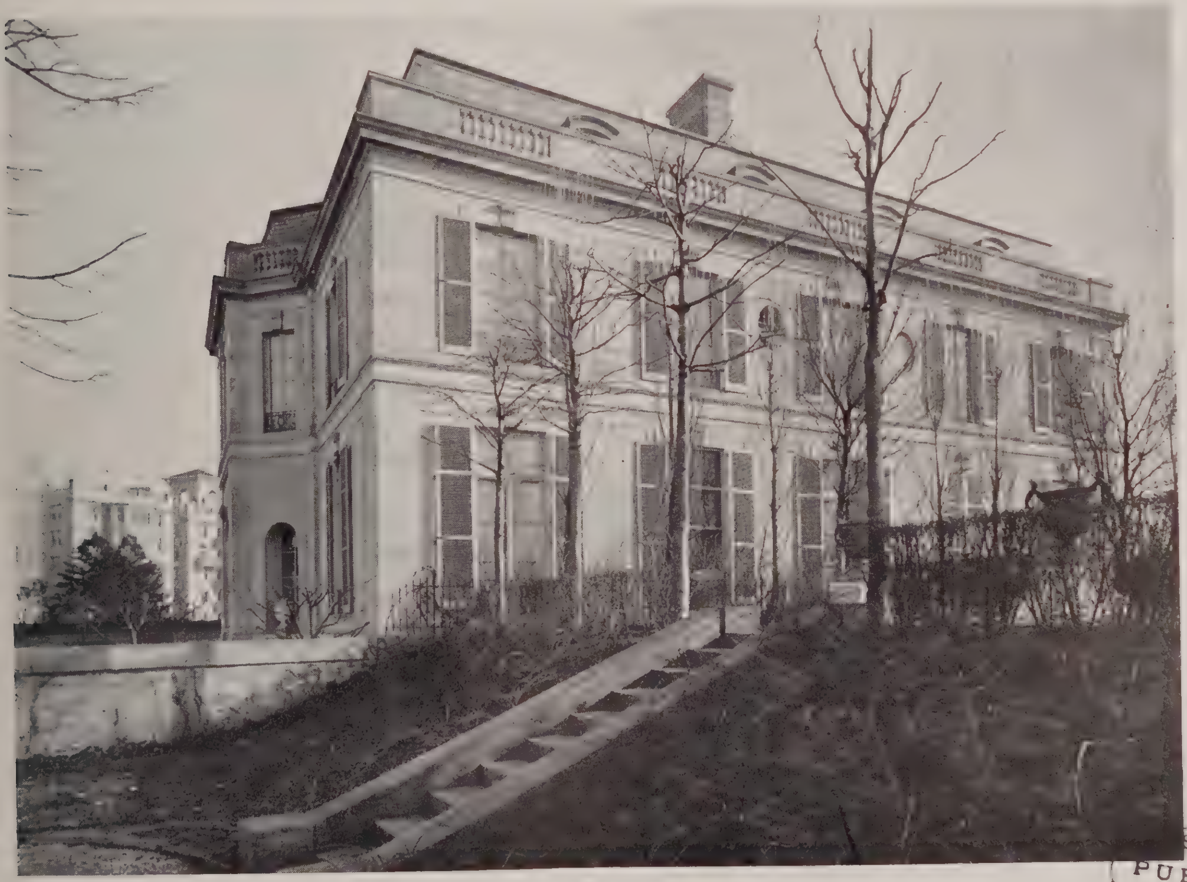
Office of John Russell Pope, Architect

gesture that reflected a graceful scheme of life.

On the terrace elevation there are tall windows with tall shutters, a curved bay with composite columns, ironwork that can only be called, in spite of its material, charming. For some reason, perhaps because of half-forgotten memories of an autumnal Versailles, one thinks of this terrace as on a late October afternoon, with a few yellow leaves fallen in the gravel walks,—a warm, distant haze, and the curious sadness that there is in places very beautiful and perfect. The outer elevation of the terrace shows to the street only a high wall, with a rail partly solid and partly balustraded, and garage doors opening at the street level. It is a proper rear elevation for such a house,—dignified to the point of urbanity; exclusive as a chateau was exclusive when peasantry peered through its tall iron gates. Undemocratic? That was an architecture that did not even pretend to be democratic, and could not have been democratic even if it had considered the pretense worth making, and which it most assuredly did not.

The approach to the interior is a sweeping stair, up from a foyer. There is the scale of the Grand Manner in the array of tall columns, and there is an incredible perfection of scale in every moulding and in the gracefully cursive ironwork of railings and consoles. *Au premier etage* the foyer looks through three arched openings into a sitting room,—it might be called an *entre salle,* —exquisitely done, the walls in the architectural manner so essentially of Louis XVI, with Ionic pilasters, bas reliefs over the doors, and classic busts on console brackets. In this room there is the bow window which we have already seen from the terrace, and to enter, from the foyer, one passes between two sphinxes, a delightful fancy of the period, strictly classical as to their bodies, and with the high coiffed heads and coquettish realism of eighteenth century courtesans.

The ball room, as might well be supposed, is an affair of Corinthian pilasters and crystal chandeliers, of sectional mirrors and beautiful ironwork,—highly stylized, gracious, ultra-formal, with a formalism that is not cold. In the creation of this kind of a room the Style Louis XVI excelled,—and its re-creation here achieves the old illusions without being, even remotely, antiquarian. The dining room is, as might be expected, chaste to a degree. It is a room of finely



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West Facade
"Meridian House," Residence of Irwin Laughlin, Esq., Washington
Office of John Russell Pope, Architect

planned plaster panels, its mantel very, very stylized, and its only other conspicuous feature a fine French tapestry. The whole manner of this house, deriving so definitely from the eighteenth century France of Louis XVI, is grand without being grandiose; impressive without being pompous; rich without being ornate. The library is more *intime,* and properly so. There would need to be, in this kind of a house, something to serve as a living room. Here the possessions of the people who live in the house become more important than the architecture. From the nature of things this would have to be so, and an intelligent architect is the first to recognize it. No matter how much a house is designed for a formal scheme of life, and for formal entertaining, there is much of life to be lived otherwise than in this manner, and of this account must be taken.

Certainly the manner of this house has not, in this country, been better done, not only in terms of stylistic authenticity but in terms of pure architecture, meaning good taste in selectivity, in elimination, in execution. It cannot, from its nature, do otherwise than set a standard which should endure permanently,—a standard which should be seriously considered whenever a prospective builder decides he must have this or that type of house from the historic pages of our great picture book of European precedent.

There is, in this distinguished house, more than mere stylization. There is an unusual degree of good taste with refinement of scale in mouldings and other profiles carried out with far more fidelity to the very essence of the style than is observable in most contemporary work of the period in France. There are, in fact, plenty of very poor examples of the style of Louis XVI in France, and few that could so well be presented as an exemplar if a student were to ask for a consistently fine example. The grandiose heaviness of Mansart and Oppenord, plus the fantasy of the Rococo, were not transformed either suddenly or completely into the chaste delicacy of Louis XVI.

W. H. Ward, a very thorough English authority on the whole evolution of eighteenth century French architecture, is valuable to quote if one would refresh one's memory of the circumstances that brought about the French classic revival that culminated in the ultra-classic styles of the Directoire and the Empire. "This period," writes Mr. Ward, "is marked architecturally by a reaction toward antiquity and simplicity; and though the reign of Louis XVI covers but a small portion of it, the style which resulted from this reaction has by common consent received his name. Its beginnings may be traced to the second quarter of the century when the Palladian Rococo compromise was generally accepted in France, and Baroque and Rococo held undivided sway in Germany, Belgium and Spain." New discoveries in Pompeii and Herculaneum stimulated a first hand appreciation of antiquity, and the didactic Palladian doctrines, together with the dictates of Vitruvius, began to lose their authority. "Antiquity began to appear in an entirely new light, and architectural thinkers realized that they had hitherto been accepting a mere fragment of the performance of Rome as fully representative of the whole architecture of the classical ages. They now saw that the departures from Vitruvius' canons already observed were not isolated aberrations,—that the ancient architects, and especially the Greeks, had been wholly unconscious of the existence of such canons. Instead of handing down to posterity the vivifying principle which had brought the whole glorious art of antiquity into being, Vitruvius was seen to have nothing to offer but a sort of pemmican, compounded out of a few specimens, and those not all of the first quality. . . . The whole edifice of rules and orders, proportions and modules, so laboriously built up by a long line of writers, stretching from far-away Albert to Briseaux in their midst, was seen to be raised on phantom foundations, and down it came about the ears of the architectural world like a house of cards. . . . These revelations, far from discouraging the study of antiquity, only convinced men that much more might be learned from ancient monuments than the academic school had supposed. More than this, it was the opinion of many thoughtful persons that the restoration of a simple and noble style could be attained only by such study. . . . Architects exhibited an increasing submission to the guidance of antiquity, with whose monuments there was now a wider and closer acquaintance. Yet the old academic methods, though shaken, on the whole maintained their sway, and the new ideas influenced detail and ornament more than composition. . . . The resultant style is characterized as regards the main architectural lines by a four-square sobriety; as regards decoration by refinement; and generally by classical purity."

This would fairly describe the Laughlin house, in which it seems as though the architect had taken the style of Louis XVI, with all its defects, and converted every defect into a perfectly stylized virtue. Outside a few superficial writings, and an unexamined tradition, this style seldom attained the classic perfection at which it aimed. For this reason, among others, Mr. Pope had no inconsiderable advantage over the architects of the time of Louis XVI. He could examine their works, get an idea of the thing they were trying to do,—and then do it better. Certainly there is nothing experimental in the technique of the Laughlin house inside or out, for here are fine forms rendered with the utmost finesse of manner.

7.a.

THE
ARCHITECTURAL
FORUM

IN TWO PARTS

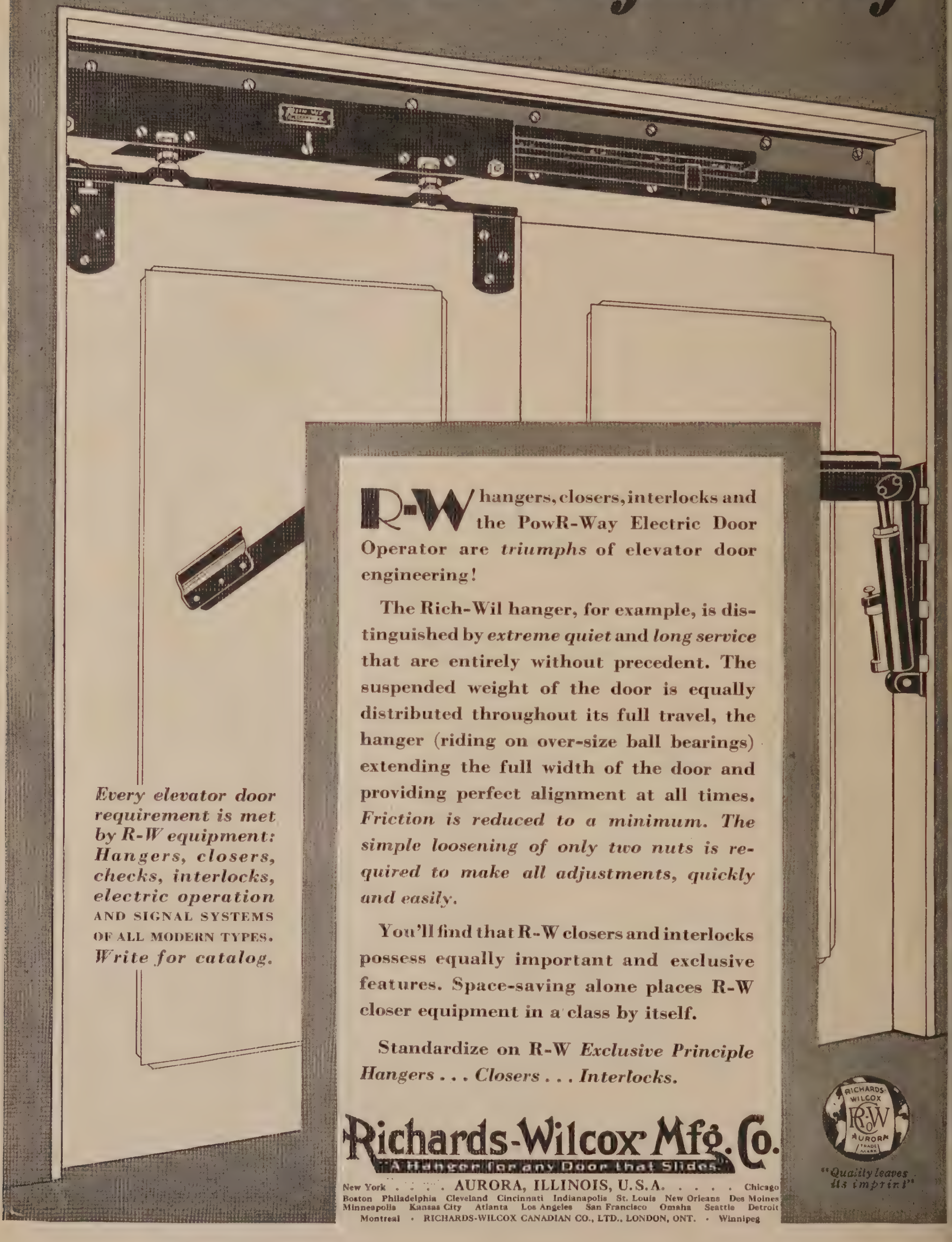
ARCHITECTURAL ENGINEERING
&
BUSINESS

PART TWO

AUGUST

1929

NOTEWORTHY CONTRIBUTIONS *to elevator door engineering*



R-W hangers, closers, interlocks and the PowR-Way Electric Door Operator are *triumphs* of elevator door engineering!

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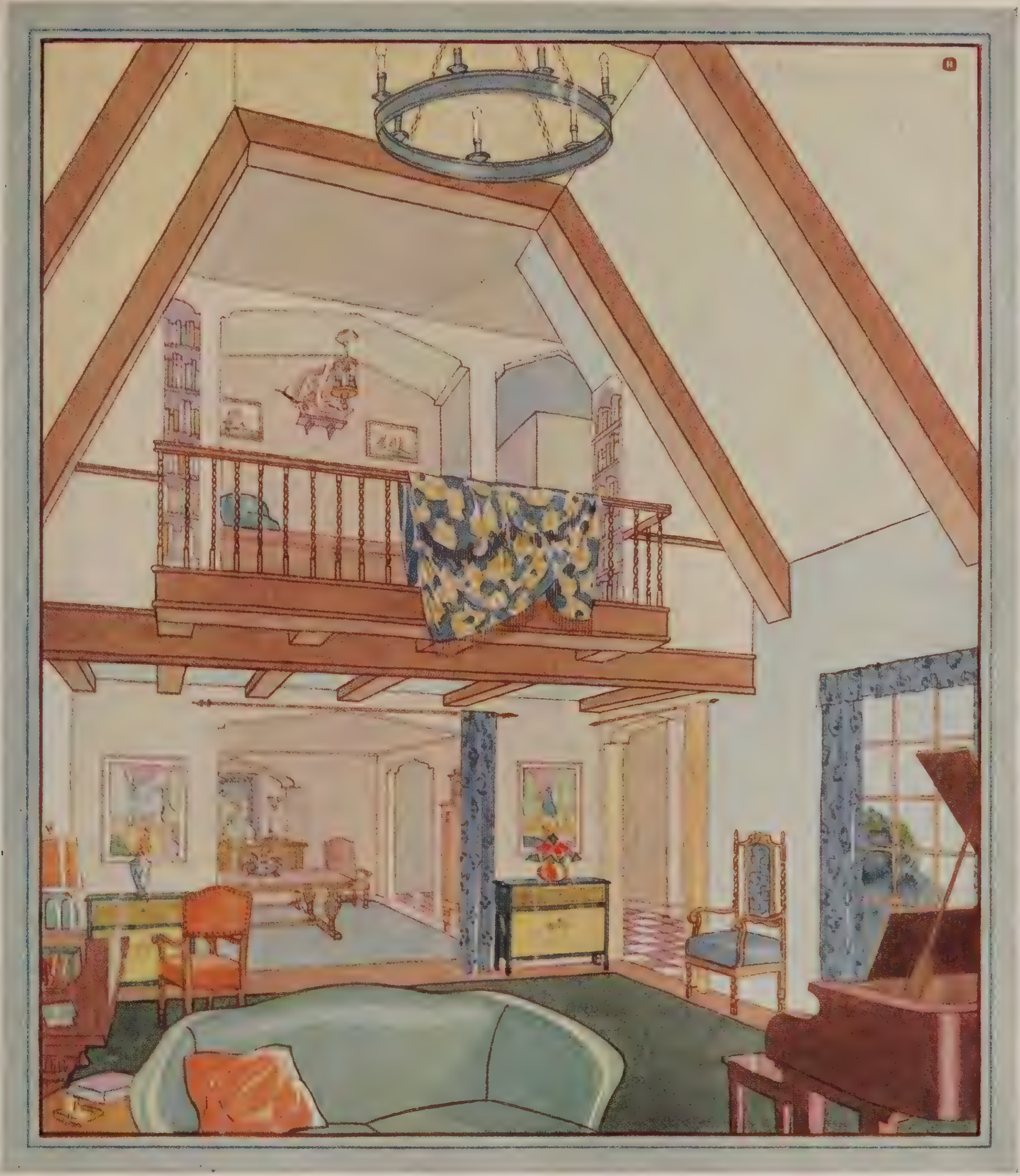

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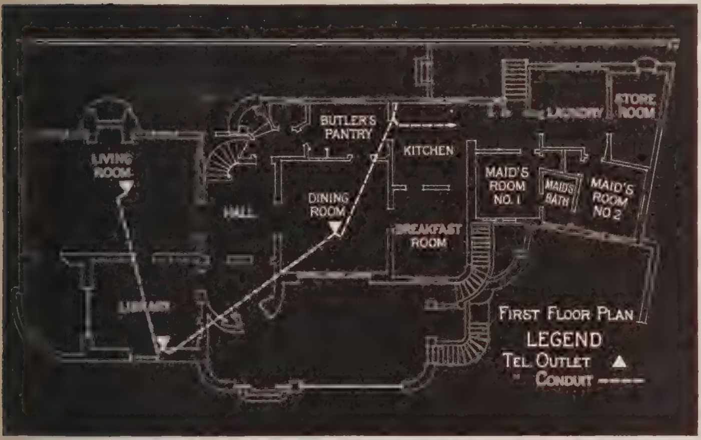
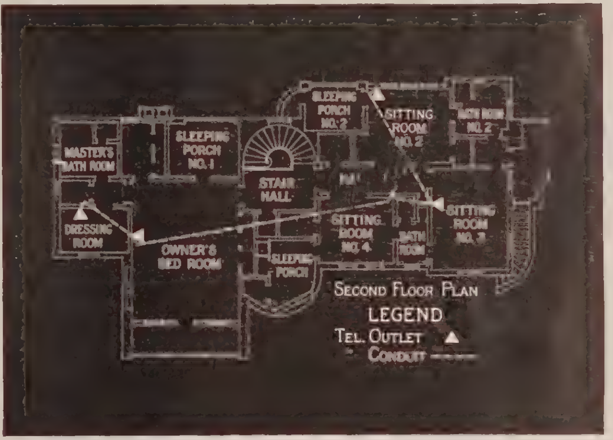
The Telephone needs of the Nation are Changing

The Piedmont, California residence of Mr. R. J. McMullen, with accompanying floor plans, showing the telephone outlets and conduit layout which provide for modern telephone convenience.—Frederick H. Reimers, Architect.





With the growing appreciation of the important part communication plays in every-day life, there is coming a radical change in the telephone needs of the nation. Especially is this true as to the number and location of telephones within the home. Where previously one, or possibly two telephones were considered sufficient, people today want telephones throughout the house. . . . Particularly in those rooms most frequently used, so that calls may be made and answered without waste of time or effort.

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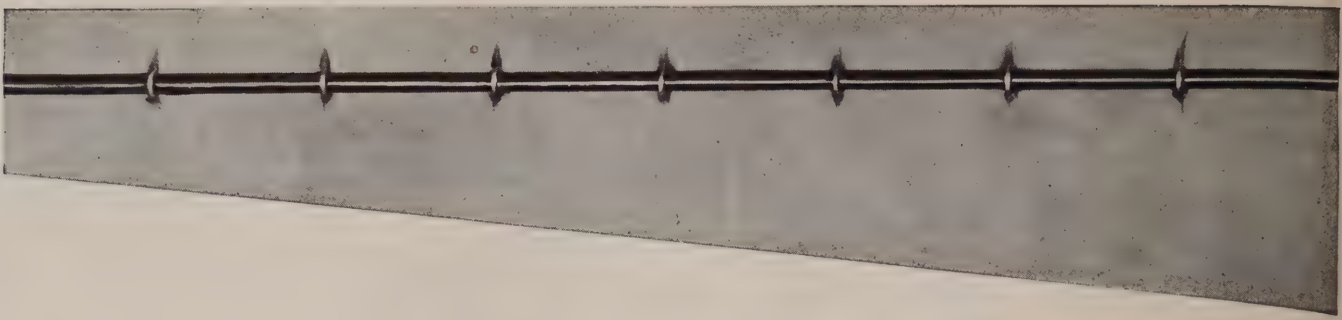

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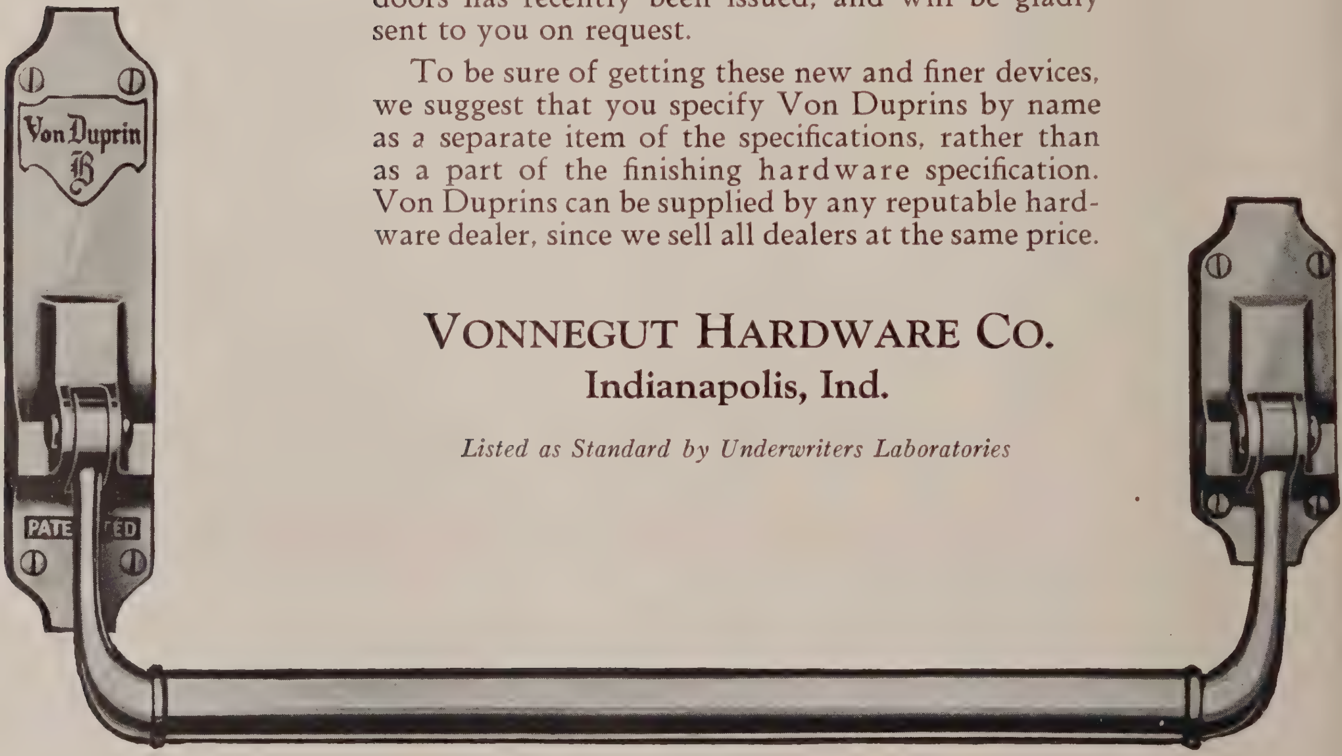

BOOK DEPARTMENT

AMERICAN ARCHITECTURE OF THE TWENTIETH CENTURY

A REVIEW BY

DOUGLAS WILLIAMS

ALTHOUGH the outstanding examples of recent architecture have been made familiar through the pages of the architectural journals, members of the profession will be able to appreciate the value of a publication made up of large loose leaf plates showing illustrations and measured drawings of these great buildings in a compact and well organized manner. The collection of plates which is the subject of this review is one of the first important attempts on the part of an architectural publisher to cover the important subject of American architecture of the twentieth century in anything like a complete, compact and usable form. Certainly material of this sort should be greatly in demand by the architectural profession, since it presents clearly the form, proportions, and detail of the best examples of buildings which go to make up the outstanding achievement of twentieth century architecture and of the American people for all time.

Alabama Power Building, Birmingham
Warren, Knight & Davis, Architects

The skyscraper form of building is a distinctly American type and is the product of a great industrial people. The so-called classical styles were undoubtedly beautiful and filled the needs of the people by whom they were developed, but in the present era of frenzied activity and intense concentration of business industry within limited areas, these classical types have been found to be quite inadequate, and it became necessary to develop an entirely new order of construction and new forms of building materials so that greater freedom might be had in building vertically to great heights. At first, attempts were made to support buildings on masonry walls, but when the structures exceeded six or seven stories in height the lower walls were of necessity so massive as to occupy the greater part of the lower floor space. The problem of verticality was solved by the use of steel or ferro-concrete framework supporting curtain walls of masonry. The height to which such structures may be carried now seems to be almost unlimited, and as we look at the Chanin Building and realize that on the opposite corner will be a still taller structure, we wonder where the thing will end. It early became apparent that the construction of so many enormous structures along the edges of comparatively narrow thoroughfares would result in the streets becoming dim and narrow canyons such as are found in the lower part of Manhattan today. In providing for the elimination of this condition, the city planners unwittingly invented a type of structure which in the hands of our best architects has resulted in the beautiful "set-back" style and has brought to the world an entirely new architectural type. Inspired by the greater possibilities latent in the new building materials, designers have developed a new form of design which, in its better manifestations, is characterized by a dignified simplicity and appropriateness to the spirit of modern times. New freedom in design naturally is not restricted to structures of the skyscraper type but has resulted in many beautiful edifices among other classes of buildings, such as churches and smaller buildings where the need for height was not so pressing as in other buildings.

As we continue to develop, it is difficult to foresee what the future may have in store, and it would be impossible at this time to predict anything in the nature of a final work on twentieth century architecture. It therefore seems very fitting that the publishers and editor of the present series of illustrations and drawings have chosen to issue it in the form of a progressive publication of separate volumes and parts, each of which may be purchased separately. In this way the development and trends of building design may be followed and a splendid collection of reference on the new architecture be built up as rapidly as further

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GRADE SCHOOL BUILDINGS; BOOK II

IN no department of architecture have the last ten years seen quite the progress which has been made with schoolhouses, a class of buildings of the first importance, since they exert a strong influence upon their communities, and by their architectural excellence or the lack of excellence they elevate or lower the architectural standards of entire districts. Study of school structures, particularly at the hands of a group of well known architects, has resulted in their being given a high degree of architectural distinction and dignity in the way of design, while study directed toward their planning and equipment has led to their being practical and convenient far beyond what was regarded as an advanced standard of efficiency anywhere in America even a few years ago.

Kensington Schoolhouse, Great Neck, N. Y.
Wesley Sherwood Bessell, *Architect*

THIS volume, a companion to another published in 1914, records the results of endless study and experiment in different parts of the country, summed up and presented. By illustrations of exteriors and interiors, by floor plans and carefully written descriptions and articles by well known architects and educators, the present high standard of schoolhouse design is made plain, and these results which have been achieved by a few architects and school boards are thus made possible to all architects who are interested in schoolhouse design. The compiler has selected from almost 1000 exteriors and floor plans the school buildings to be illustrated, and the volume records "a process of innovation and elimination, namely, the introduction from time to time of features which have been deemed desirable and practical, and the elimination of things which, owing to changed school methods, are no longer required."

400 pages; 7¾ x 10½ inches
Profusely Illustrated; Price $10

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progress is made. The size of the plates, 14 by 20 inches, together with the fact that they are loose leaf, makes them extremely usable, and their collection into portfolios of 20 plates also adds to their utility. The work is carefully edited by Oliver Reagan, A.I.A., and the paper, printing and general make-up of the work resembles the well known monograph of the work of Mc Kim, Mead & White, published likewise by the Architectural Book Publishing Co., Inc. The choice of buildings to be shown is left to the readers, and subscribers are invited to write suggesting the names of buildings they would like to have shown. The publishers agree that when a sufficient number of such requests have been received for a given building, that structure will be presented in a forthcoming issue.

Six parts of this series have already been issued and include a notable selection of important American buildings including the Bowery Savings Bank, New York; Ford Engineering Laboratory, Dearborn, Mich.; U. S. Army Supply Base, Brooklyn; Indianapolis Public Library; Grauman's Metropolitan Theater, Los Angeles; Panhellenic House, New York; Irvine Auditorium, U. of P., Philadelphia; Los Angeles Mail Order House of Sears, Roebuck & Co.; and many other outstanding buildings of the same class representing the work of many of the foremost American architects of the day.

Of course no work on our modern architectural design would be complete without examples of the work of Bertram Grosvenor Goodhue, who played such an important part in the origination and development of the new type of design. A complete portfolio of 30 plates is devoted to some of the best specimens of his work, including the Nebraska State Capitol; the Church of St. Vincent Ferrer, New York; the National Academy of Science, Washington; and the Los Angeles Public Library. Of the buildings published thus far, from two to four plates of illustrations and from one to four plates of drawings are shown for each, the photography being done in the best architectural manner so as to show the proper proportions and as much detail as possible, and the choice of subjects is representative of all classes and types.

AMERICAN ARCHITECTURE OF THE 20TH CENTURY. A Series of Illustrations and Measured Drawings of Commercial and Industrial Buildings. Edited by Oliver Reagan, A. I. A. Complete in 4 Volumes or 12 Parts, each Part containing 20 plates, 14 x 20 ins. Price per Part in Portfolio, $8.50; Price per Bound Volume, $30. Architectural Book Publishing Co., Inc., 108 West 46th Street, New York.

THE AMERICAN SCHOOL AND UNIVERSITY, 1929-1930. 462 pp., 7 x 10 ins. Price $5. American School Publishing Corporation. 443 Fourth Avenue, New York.

IN no department of architecture has there been made more striking progress than in its application to schools. The entire subject of schools in fact, from first to last, seems to have been so well and thoroughly studied that there is little if anything which has not been examined and re-examined, analyzed and classified at the hands of educators, architects and the designers and manufacturers of school equipment. When a school is to be established today the scope of its activities is made the subject of an exhaustive and critical survey, first to determine the need of a school, and then to discover just what type of school it should be. With the results of

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¶ In this valuable and important work two widely known architects of educational buildings collaborate in reviewing the entire situation as it applies to college and collegiate architecture. They have carefully studied practically every important institution in the country, and in their text they discuss administration buildings; dormitories; recitation halls; chapels and auditoriums; gymnasiums; libraries; and structures intended for certain definite and specific purposes, such as the teaching of music, all this being well illustrated with views of existing buildings and in many instances with floor plans and other drawings. A valuable and extremely practical work to add to the equipment of any architect's office.

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such a survey as a foundation, there comes consideration of a site with reference to its accessibility, its being near the center of the district to be served, the character of its surroundings, the nature of its soil, etc., and all this before there comes more than slight consideration of its architecture. With extensive data thus at his command, the school architect approaches its actual planning and designing, aided constantly by highly trained and experienced educators and by the designers and makers of every possible detail of school equipment, the school when finally completed and turned over to the school board and teachers being probably the last word in completeness and in architectural and mechanical excellence and well fitted to perform the work for which it was built. All this now forms the subject matter of many publications,—weekly, monthly or annual,—and recently there have been published a number of excellent works dealing with different aspects of the school problem.

This volume is the second annual edition of "a year book devoted to the design, construction, equipment, utilization and maintenance of educational buildings and grounds," and among the names of the many contributors who have collaborated in the preparation of the work one notes those of leaders in all the fields which are concerned,—widely known educators, architects, landscape architects and others. The completeness of the work and the thoroughness with which it deals with the subject might be indicated by an enumeration of its chapter headings: I, Selecting the Site and Planning the Budget. II, Design and Construction of Buildings. III, Modernization, Maintenance and Insurance. IV, Landscaping and Upkeep of School Grounds. V, Buildings and Equipment for Physical Education and Play. VI, Classroom, Office, Library and Auditorium. VII, Home Economics,—Cafeteria,—Laundry. VIII, Laboratory and Shop. IX, Chemical Index. X, Distributors of Equipment. XI, Architects for Educational Buildings. XII, School Superintendents in Cities of 10,000 and over. XIII, State Departments of Public Instruction. XIV, Alphabetical and Classified Lists of Manufacturers. School boards today depend upon their architects for far more than mere architectural service. The architect is expected to be fully informed regarding a host of subjects not even remotely concerned with architecture, and often in proportion to his knowledge and resourcefulness is the value of his service gauged. The excellence of this work entitles it to circulation among architects interested in any type of school architecture.

OLD WORLD MASTERS IN NEW WORLD COLLECTIONS. By Esther Singleton. 441 pp., 7½ x 11 ins. Price $10. The Macmillan Company, 60 Fifth Avenue, New York.

EVEN before the beginning of the World War period, vast changes were taking place in the world. Countries which for ages had been leaders in commerce, in industry, in art, and in every other form of activity found their power gradually waning as the Republic of the West increased in strength and power and moved ever more and more toward the center of the world's stage. The Great War, which left the greater part of Europe impoverished if not actually ruined, meant the unconditional surrender of the Old World to the New, and gain to America in possibly more ways than one in

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perhaps a ratio out of all proportion to Europe's loss.

In every age conquerors have taken toll of the art treasures which circumstances have placed at their disposal. The practical Romans laid heavy hands upon the riches of cultured Greece; persecuted Christianity emerged triumphant from the catacombs to plunder the temples of pagan antiquity for material of which to build the Christian fanes which presently arose; St. Mark's, that treasure house of splendor, meant much pilfering from the East; Napoleon dealt with ruthless hands with many of Europe's museums, and in fact many a museum has been enriched at the cost of those in other countries, the balance having been sometimes restored when later wars and other victories made restoration necessary. Long before the Great War the world's art treasures began coming to America's shores,—the result not of victory in battle, unless economic and commercial rivalry be so considered, but due to America's lavish and constantly increasing wealth. Paintings, marbles, tapestries, statuary and other works of art which for centuries had been among the ancestral possessions of great families were suddenly found to be in American museums or private collections. Even some cathedrals and ancient monastic foundations found themselves unable to resist the lure of gold offered them by the resourceful art dealers who constitute the link connecting owners old with owners new, and today one has ceased to express surprise at hearing that some priceless treasure has passed from the possession of an Italian prince or an English duke into that of some American manufacturer or banker. The transfer of ownership, it might be observed, is much more than likely to be eventually to the advantage of the world, taking the world as a whole. Americans as a rule bequeath their collections to public museums where they enrich the facilities for public culture, while in Europe the same treasures served merely to give pleasure to their owners and their owners' friends.

In this volume an author widely known as holding accurate and conservative views on art has made a survey of the paintings by the great masters of Europe which at present are in American private collections. The work deals with rather more than 100 paintings, and to facilitate the preparation of the volume she has had the enthusiastic coöperation of the collections' owners. The work, be it understood, deals with portraits, mythological and *genre* subjects and with some subjects which are religious, but leaving out subjects which portray suffering; here there are no pietas, crucifixions, or paintings of saints undergoing martyrdom. Under the general heading of Italian painting the author considers work of various schools,—Siena, Florentine, Umbrian, north Italian, and Venetian, and then in their turn she deals with painting of the Flemish, Dutch, German and Spanish masters and with the work of France and England during the eighteenth century. The author, as has been already suggested, approaches dealing with a subject so important with extensive background. She is already widely known for her writings on various departments of art, and the volume's illustrations as well as its text have been prepared with all the thought and care which one would look for in a work from her study.

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EDITED BY

C. STANLEY TAYLOR and VINCENT R. BLISS

Here is a volume which for the first time adequately reviews the entire subject of the modern hotel,—its planning, designing, equipping, decorating and furnishing. It covers every detail, from the beginning of sketch plans to the registration of guests when the house has been completed and opened. All the different types of hotels are dealt with,—the Modern Commercial Hotel, the Residential or Apartment Hotel, the Resort Hotel, and the Bachelor Hotel. The volume is replete with views of hotels in different parts of the country; their exteriors and interiors, and in many instances their plans are included and fully analyzed.

The editors have been assisted in the preparation of the work by widely known hotel architects and interior decorators and by actual operators of hotels,—practical men, experienced in the management of the "back" as well as the "front" of a hotel. The volume's treatment of hotel furnishing and equipping constitutes the final word on this important subject. There are included views of hotel restaurants, cafeterias, kitchens, pantries, "serving pantries," refrigerating plants and all the departments which are necessary in a modern hotel of any type. The work is of inestimable value to architects and engineers, as well as to practical hotel men.

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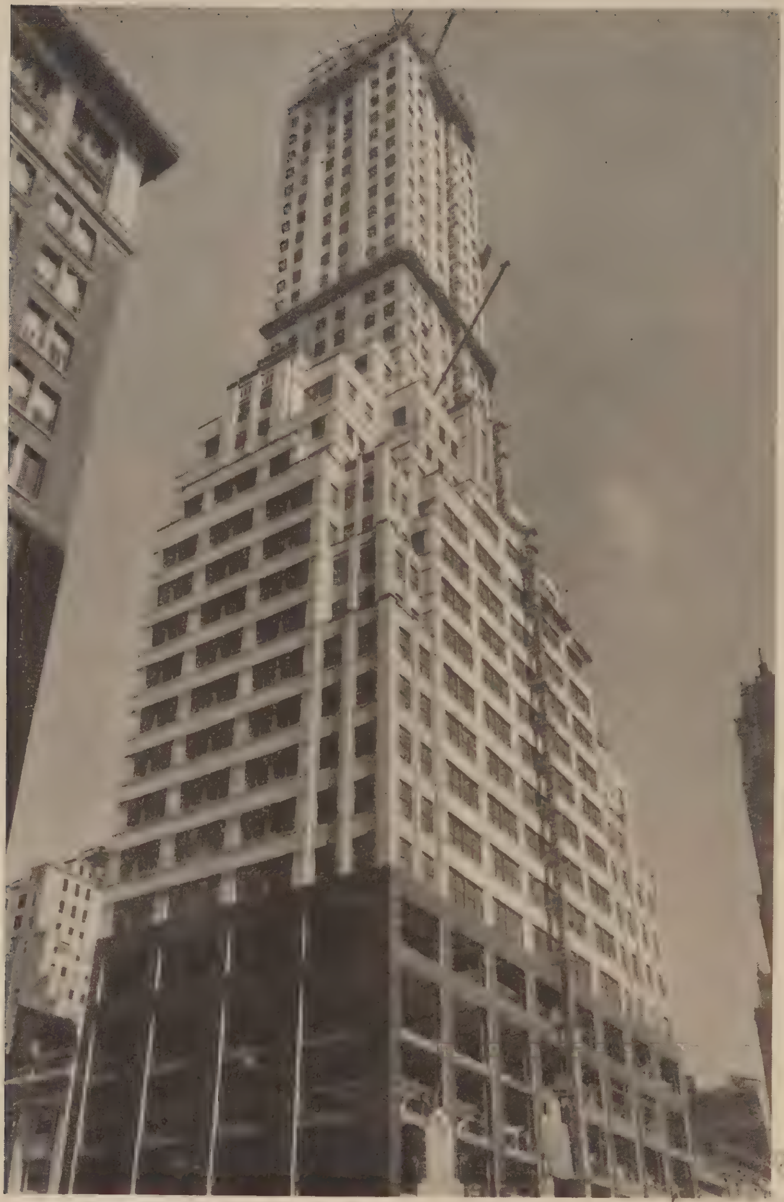

Vertical Perspective

VIEW OF THE FULLER BUILDING, NEW YORK

WALKER & GILLETTE, ARCHITECTS

Photo. George H. Van Anda

The Architectural Forum

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AUGUST 1929

THE CONSTRUCTION AND EQUIPMENT OF THE FIDELITY-PHILADELPHIA TRUST BUILDING

SIMON & SIMON
ARCHITECTS AND ENGINEERS

IN the construction of the Fidelity-Philadelphia Trust Building, Philadelphia's largest office structure, within 16 months from the time wreckers went on the site until the completed structure was turned over to the new tenants, emphasis was placed on the time element, important in large building enterprises. In Part One of this issue of The Forum there is a description of the architectural features of this building. In this article it is proposed to extend this description to cover the constructional, structural, mechanical and electrical features of the building.

Demolition. On January 24, 1927, a contract was awarded to Irwin & Leighton of Philadelphia. On March 1, 1927, work began on the demolition of the existing buildings. This work was an important factor in the limit of time allowed for the completion of the structure and affected the entire building program. One of the old buildings was a large theater, the foundations of which were of rubble, mass concrete and brick. The structural frame of this building was of steel, and the floors, balconies, proscenium arch, box fronts, lobbies, etc., were of reinforced concrete with slabs from 8 to 12 inches thick. In fact, this applies also to the reinforced concrete in the theater building, all of which was extraordinarily heavy in keeping with the building practice of the day when concrete construction had not been sufficiently developed to permit the use of light slabs and modern reinforcement. Because the use of dynamite might have inconvenienced neighbors or have endangered wheel and pedestrian traffic, skull crackers were employed to reduce these large masses of concrete to fragments which could be conveniently removed.

Foundations. An elaborate system of core borings was made, and the location of the ledge rock was definitely determined prior to the preparation of the foundation design. Calculations were made of a number of kinds of foundations, and the final decision was for the open caisson type which accomplished the required purpose in the least time and with the minimum expenditure. The large tonnage of the column loads required that the foundations be carried to the solid rock, and accordingly a foundation was build for each column. There are 138 caisson foundations varying in size from 3 feet, 8 inches square to 8 feet, 4 inches square at the top. The caissons are of concrete, cast in place, unreinforced except at the tops immediately below the points of application of the column loads. Considerable difficulty was experienced in sinking these caissons, as the level of the ground water is approximately 45 feet below the curb. Owing to the density of the soil overlying the rock, it was found after experiment that the only way to expeditiously construct these foundations was by pumping the ground water from each caisson pit. The same type of foundations, although entirely apart from those of the building, was used for the safe deposit vault which measures approximately 38 feet wide, 91 feet deep, and is two stories in height. There was nothing extraordinary about the character of the foundations, except that record speed was made in building them, considering the fact that it was necessary to begin work on many before the demolition of the buildings overhead had been begun.

Underpinning. It was necessary to underpin the westerly wall of the Witherspoon Building, adjoining the Fidelity-Philadelphia Trust Building on the east. The Witherspoon Building is 15 stories in height; several of these stories are unusually high due to there being an auditorium, thus making extraordinarily heavy concentrated loads. Several different methods of underpin-

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View of Steel Construction Showing the Girder Over the Banking Space

ning were considered, but that which would cost the least money and which could moreover be the most rapidly performed was the erection in individual sections of a concrete wall of adequate thickness supporting the foundations of this building to the depth of the lowest excavation of the Fidelity-Philadelphia Trust Building. This wall was supported on concrete-filled steel-shell piles 16 inches in diameter, the steel shells being ⅜ inch in thickness and designed to carry the entire load to bed rock. Each individual pile supported not more than 60 tons and was tested to 90 tons without producing settlement. The Fidelity-Philadelphia Trust Building stands on gneiss rock at a depth of about 60 feet below curb.

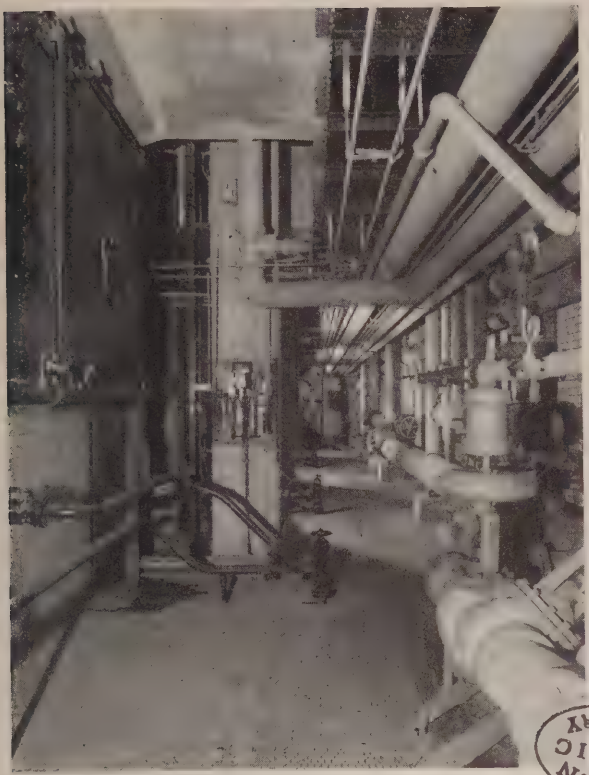
Less than two months after the contractors began work, the first caisson was sunk. Four months later, in the presence of officials of the Fidelity-Philadelphia Trust Company and their guests, the cornerstone was laid. Progress was rapid, and seven weeks later the topmost structural steel member was swung into position. More than 14,200 tons of steel and 350,000 rivets were used in framing the structure. Six large girders span the top of the banking room and carry the center portion of the building. These are 60 feet long, 9 feet, 6 inches deep, and weigh approximately 58 tons each. They are among the largest girders in any office building in the city. The movement of materials was so planned that encroachment upon traffic was exceedingly small.

Steel Design. Let us consider the problem presented by the steel skeleton of the building. The heaviest dead loads for floors are those on the first floor. Those assumed for beams for this floor in pounds per square foot are:—

Marble	15
Cement	12
3-inch fill	20
4-inch stone concrete slab	48
Ceiling (of first basement)	15
Partitions	35
Fireproofing	22
Steel	10
Total	177

For girders into which these beams frame, an additional dead load of 7 pounds steel and 15 pounds fireproofing or a total of 199 pounds is assumed. Another heavy floor is that of the first basement with a dead load of 145 pounds for beams and 165 pounds for girders. For the typical office floor the dead loads for beams are:—

Cement finish	12
3-inch fill	20
4-inch cinder concrete slab	38
Ceiling or plaster	7
Partitions	15
Fireproofing	15
Steel	6
Total	113



Rear of Boiler Room, High-pressure Steam Header

View of Boilers Showing Semi-automatic Stokers

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For the girders into which these floor beams frame, an additional dead load of 4 pounds steel and 8 pounds fireproofing, or 125 pounds, is assumed. The roof loads vary according to type of material used and the location of the steel member. Over the 29th and 29th mezzanine, the dead loads are, for purlins:—

Slag	6
Cement	5
4-inch cinder concrete slab	38
Fill (average 6-inch)	33
Fireproofing	12
Future ceiling	16
Steel	7
Total	117

An average of 9 pounds was added for the girders and trusses. The roof over the board room is assumed as weighing:—

Copper	6
4-inch cinder concrete slab	38
Ceiling	20
Fireproofing	12
Steel	9
Total	89

In assuming dead loads for columns, the weight of the column, fireproofing with plaster around the shaft and reactions of the weights of heavy girders are all included. The dead load of a typical wall section is assumed at these weights in pounds per superficial foot:—

Limestone 6 inches thick	80
8-inch hollow brick	60
Plaster	5
	145
Deduction of 20 per cent for windows	29
Total	116

In each wall panel, 11 feet, 6 inches by 17 feet, 4 inches, are two windows, 4 feet, 4 inches wide by 7 feet high, permitting an allowance of about 30 per cent reduction in weight; the calculated reduction of 20 per cent is conservative. Heavier loads are assumed for walls below the fifth floor.

Other figures may throw an interesting sidelight on some of the phases of construction. At the labor peak there were 1,300 men employed on the site. Bricks of all kinds to the number of 4,180,000 were used. The cubic footage of limestone required was 100,000; 342,000 yards of plastering were done; 960,000 square feet of hollow tile partitions and 160,000 square feet of gypsum partition were erected; 116,000 square feet of Tennessee marble floor and wainscot were laid. By the terms of the original contract, September 1, 1928 was stipulated as the completion date, allowing 18 months' time. Marked coöperation between the subcontractors, contractors, architects, and the building committee made it possible for the time for construction to be shortened. In September, 1927, the date of comple-

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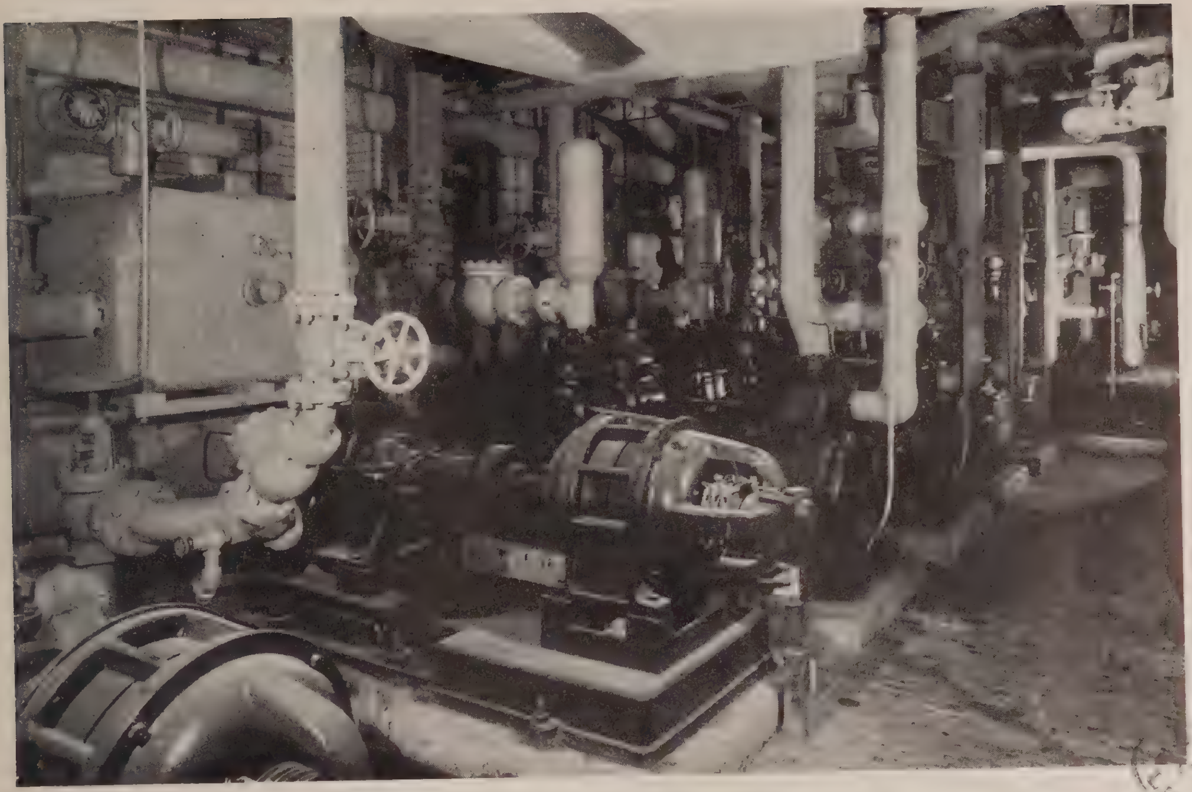
View of Main Switchboard Showing Trunk Panels and Low Tension Switchboard

tion was stipulated as June 1, 1928, three months earlier than required in the original contract. On March 1, 1928, 12 months after work had been begun, the Baltimore & Ohio Railroad occupied its space at the corner of Broad and Walnut Streets, and on June 1, 1928, in accordance with the new schedule, the office building portion was opened for occupancy, with but 15 months elapsed working time.

Elevators. The passenger elevators are arranged in two banks of ten each. One section of ten cars cares for the local passenger traffic and operates from the first to the 17th floor, at a speed of 700 feet per minute. These are of the gearless traction type with signal control and automatic floor-finding devices. The other section of ten cars serves express passenger traffic, with 800 feet per minute elevators of similar type and control to those of the other system. Two of these express shafts have openings to every floor throughout the building, and eight of them are enclosed shafts from the second to the 16th floor inclusive. In the banking house there are installed for operation between the second basement and the fifth floor, six elevators operated at a speed of 450 feet per minute. Two service elevators with a speed of 600 feet per minute open from the lowest or third basement to the 29th floor inclusive, and are used for freight and general building service.

The power plant in the lowest basement has five water tube boilers, semi-automatically stoked and built for a safe working pressure of 160 pounds per square inch. Three of these develop a horse power of 413½ each, and two 185 each, giving a combined normal horse power total of 1,610. From this plant are furnished the heat of the building, high pressure steam for pumps, and medium pressure steam for the kitchens. Three 6,000-gallon capacity oil tanks have been installed to be ready should the necessity for using this fuel ever arise.

The heating system is of the two-pipe vacuum return type with steam feeder main in the pipe loft of the 23rd floor. The office and bank portions have separate feeder mains, and the banking room is provided with a system of temperature control with automatic thermostat arrangement. Automatic control has been installed in the offices to shut off heat from radiators only. An elaborate system of ventilation assures an adequate supply of fresh air for all units of the building. The entire banking area has both supply and exhaust ventilation. In the main banking room four complete changes of air are accomplished every hour. This air is introduced to the system at the sixth floor level above the point where street dust contaminates, where it is filtered and then distributed. An independent supply of air is provided for the bank vaults.



Boiler Room Mezzanine Showing Steam- and Motor-driven Pump and Condensate Meter

Electrical System. The entire electrical requirements of the building can be carried on either of two 13,200-volt feeders, which enter the building from the Philadelphia Electric Company's service. In case one feeder should fail, a bus tie oil circuit breaker is automatically closed, which energizes the entire main truck board from one feeder, since the main high tension truck switchboard is arranged in two sections, one 13,200-volt feeder going to each section. When the feeder that fails is again placed in service, the incoming line oil switch on that feeder is automatically closed, and the bus tie switch is automatically opened, thus restoring the normal service. In case of trouble on a regulator, it is automatically shunted out of the circuit. There are two feeder regulators, each of sufficient capacity to carry the entire load, controlled by a six-board high voltage truck switchboard.

A bank of 13,200-volt primary to 230 volts secondary is of sufficient capacity to furnish all of the power requirements, excepting the elevators. A similar bank of transformers, except 115 volts secondary, furnishes the lighting requirements. A third bank of high voltage transformers, with 2,300 volts secondary, furnishes the electric elevators with power, and in an emergency will operate the fire pump. Although these nine transformers will meet the total requirements, there is installed a duplicate bank of nine other transformers, which will be automatically thrown in circuit should trouble be encountered in any other bank of transformers, so that continuity of service is assured.

The power for the elevators at 2,300 volts is fed through steel armored cable to the elevator substations located on the 18th and 28th floors. In each of these elevator substations there is located a four-panel truck type switchboard, together with transformer equipment. Two sets of transformers are used, each of sufficient capacity, so that it might, if required, meet the total demand. The switching is so arranged that one bank of transformers is normally in operation. If the load goes above a predetermined value, the other bank of transformers is automatically cut in in parallel to take care of this excess demand. As soon as the load decreases, this second bank is automatically cut out. Should trouble develop in one bank of transformers, that bank will automatically be switched out of service, and the other bank will take care of the load. By interchanging the truck panels in the elevator substations, approximately the same amount of power can be taken from each bank of transformers during certain periods of time. Also located in the elevator substations, but in separate rooms, are four-panel low tension switchboards, containing metering equipment, feeder lines, etc., for each bank of elevators.

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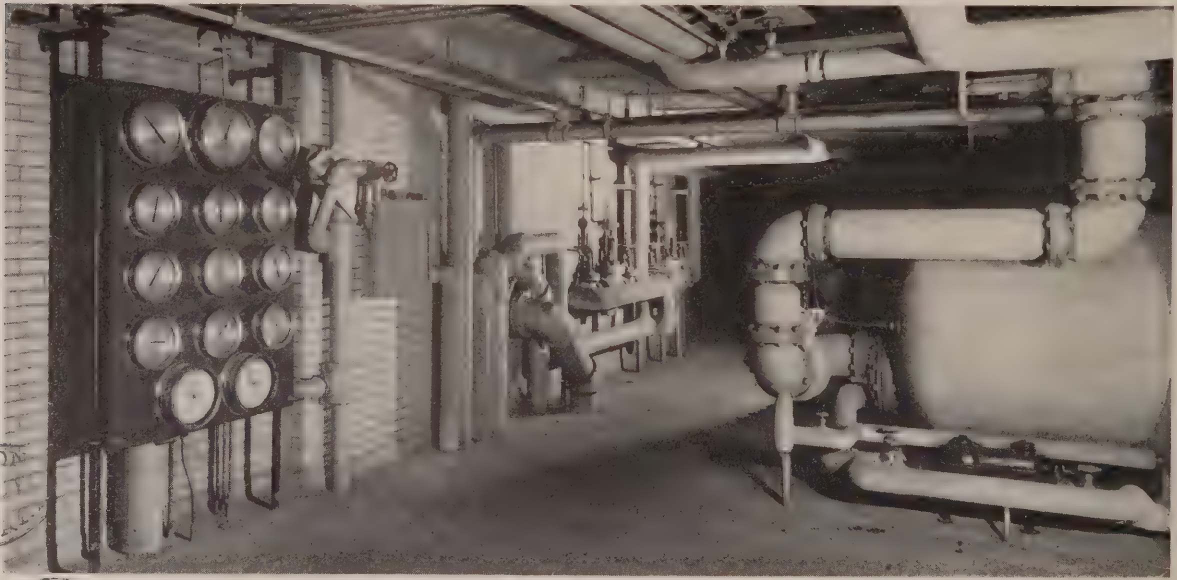
Portion of Kitchen for Bank Employes' Dining Room

A 15-panel low tension switchboard in the basement distributes all of the power and lighting requirements. By means of connections on this board, the entire lighting load of the building may be instantly changed to secure its current from either of the duplicate banks of lighting transformers, or in case both of these have failed, an auto transformer may be immediately switched into service, which will then supply the lighting from either of the duplicate banks of power transformers. By means of this same switching equipment and auto transformers, should both of the banks of power transformers fail, such power as must be maintained may be secured from either of the lighting transformers. In addition, a large storage battery has been installed, which furnishes emergency exit lighting and power for the automatic operation of switching equipment. On the same floor, but located in a different room, are four battery charging motor generator sets and control equipment.

Two static condenser equipments are installed in the same room with the elevator transformers, located in the elevator transformer station. The purpose of these is to improve the power factor of the load imposed by the elevator equipment. Between 60 and 70 motors and controls are installed throughout the building for operating ventilating fans and circulating pumps. Lighting and power distribution cabinets of the most up-to-date type are placed throughout the building. There are installed in this building approximately 740,000 feet, or 140 miles, of No. 12 and No. 14 code wire. On each wing of each floor is located a meter bar cabinet type panel of unique design. The design of these panels is such that it is a simple matter to readily arrange for the metering of the electric service furnished to one or more offices through a single meter.

Bank Vaults. The vaults of the bank are in the first and second basements. These two vaults are each 86 feet long and 33 feet, 4 inches wide. The safe deposit vault in the first basement is entered from an ample public lobby accessible



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Boiler Room Mezzanine Showing Steam and Water Gauge Board, Recording Gauges and Water Pressure Reducing Valves

Another View Showing Kitchen for Bank Employes' Dining Room

View of Kitchen with Steam Kettle in Foreground

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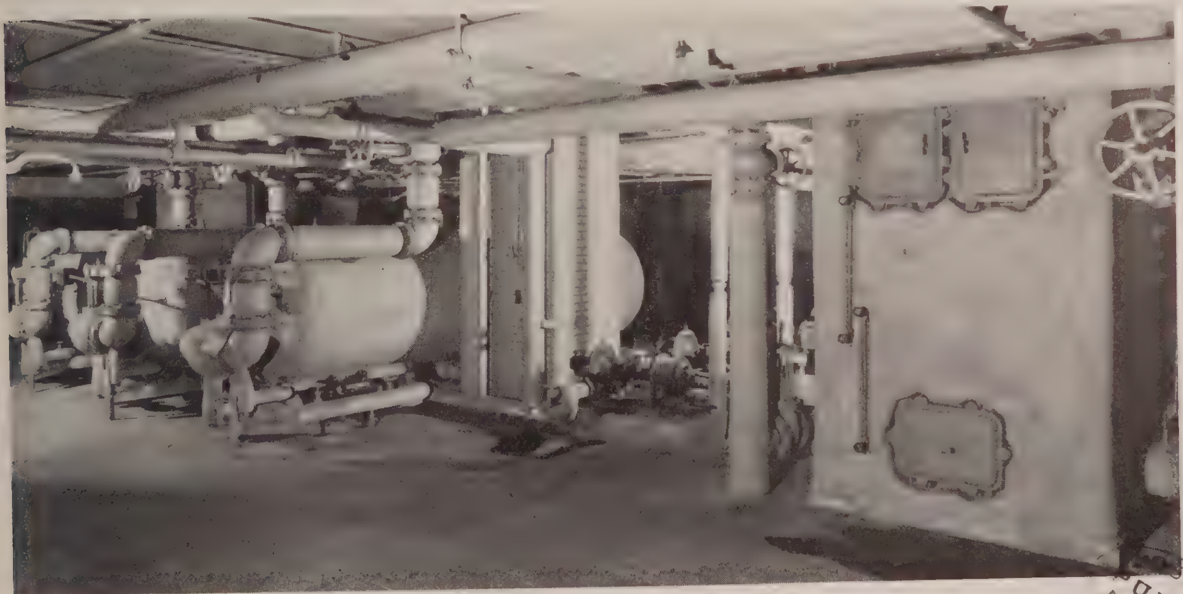
from the first floor by stairways and elevators. The vault is 12 feet, 5 inches high. Lacking only a few feet, eight full sized Philadelphia Rapid Transit trolley cars could be stored in the space occupied by the upper vault. These vaults are in reality separate structures within the building. No beams, girders or columns of the main structure pass through the vaults' walls or ceilings. Their walls and roofs are 24 inches thick. More than 200 tons of high grade steel make up the lining and equipment. Nearly 40 tons of special formula stainless steel renders the handling of the safe deposit boxes a cleanly process. The grease which has been the usual safeguard against rust is eliminated, and untarnished surfaces are maintained without inconvenience to patrons. Two electrical systems protect the vaults, while a sound accumulating system provides a third mode of safeguarding against attack. The individual booths of the safe deposit department



Hot Water Storage Heaters in Background. Boiler Feed Water Heater in Foreground

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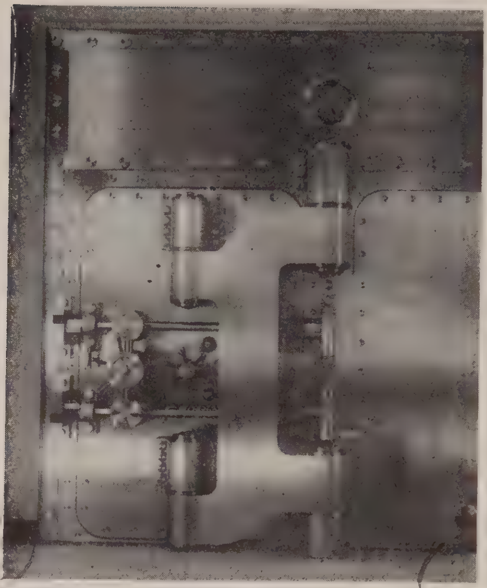
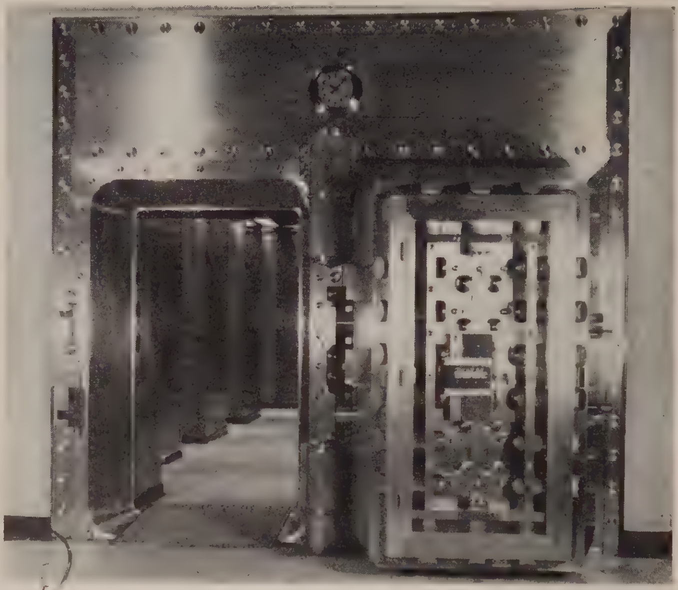
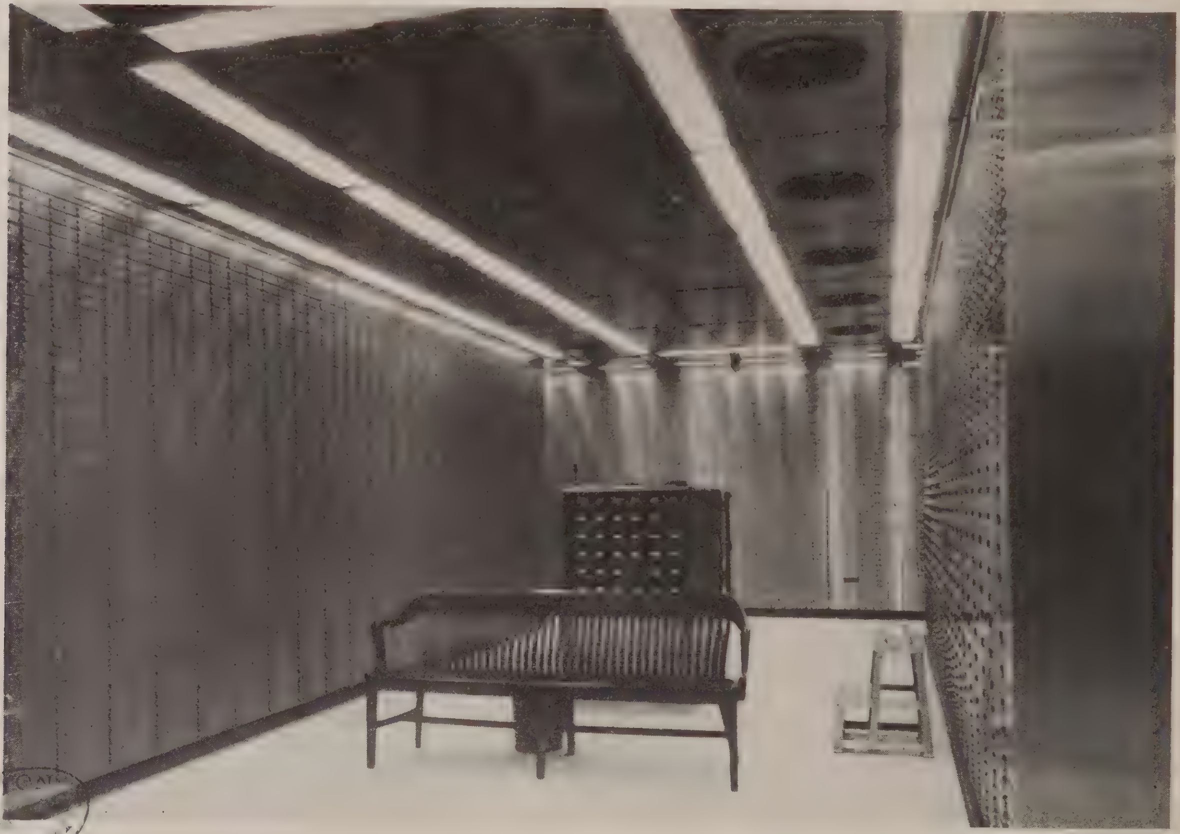


Safe Deposit Vault Door Closed



Safe Deposit Vault Door in Open Position

are so equipped that a record of each booth's tenancy and an inspection after every occupancy insure the safety of valuable papers overlooked by patrons. The vault for the bank's own cash and securities is on the second basement level. In this vault are held also those securities entrusted to the safekeeping of the bank and those in the custody of the corporate trust department.



Safe Deposit Vault. Note Special Lighting and Ventilating

CONSTRUCTION AND EQUIPMENT OF THE ATLANTIC CITY CONVENTION HALL

BY

SAMUEL L. WARE AND D. D. EAMES

Editor's Note. The portion of this article which deals with construction is taken from the paper by Samuel L. Ware, who was formerly in charge of engineering in the architectural department of Lockwood, Greene & Co., Boston, presented before the Designers' Section, Boston Society of Civil Engineers. The portions of the article treating of the heating and ventilating systems, boiler plant, fire protection, etc., were written by D. D. Eames, engineer with Lockwood Greene Engineers, Inc.

IN order to maintain her prestige as one of the foremost convention cities of the country, Atlantic City is building the largest auditorium in the world. This municipal project will have cost when finished about $10,000,000 and will accommodate 40,000 people. The building occupies a block fronting on the Boardwalk. It is located midway between the two principal groups of the largest and newest hotels. The structure is 350 feet wide and has an average depth of 662½ feet, occupying the entire block.

Design and Construction. The main auditorium floor is 350 feet wide and 450 feet long. It has balconies on three sides and a stage on the fourth. These balconies project 38 feet into the auditorium, and are so planned that there will be 15 feet clear height underneath them, thereby affording ample space for exhibition over the entire auditorium floor. In addition to the main auditorium there is a large hall, 130 by 185 feet, on the second floor in the headhouse of the building. This hall can be used for smaller conventions, art exhibitions, banquets and dancing. It has a seating capacity of 5,000, and includes a stage, a large balcony, and a small musicians' balcony. There are committee and retiring rooms at each end of this hall. On the Boardwalk side of this hall there are full height bronze doors and windows opening out to a loggia 12 feet in width overlooking the ocean. The outer side of the loggia consists of a series of arched openings.

On the Boardwalk level an arcade has been arranged across the front of the building. Along this arcade are located 14 shops faced with marble and trimmed with ornamental bronze. In the center is a large ornamental entrance, 50 feet in width, leading to the main auditorium. This entrance lobby has walls of limestone with a vaulted ceiling of Guastavino tile. Corridors lead from it and connect with ramps leading to the lower and upper levels of the balcony of the auditorium. There is a basement under the entire area. At the front of the building there are bathhouses with entrances under the Boardwalk leading directly to the beach. Space has been provided on the ground floor to accommodate 400 automobiles. One-way traffic is provided for by means of a ramp entrance on Georgia Avenue leading from the street down to the ground floor,

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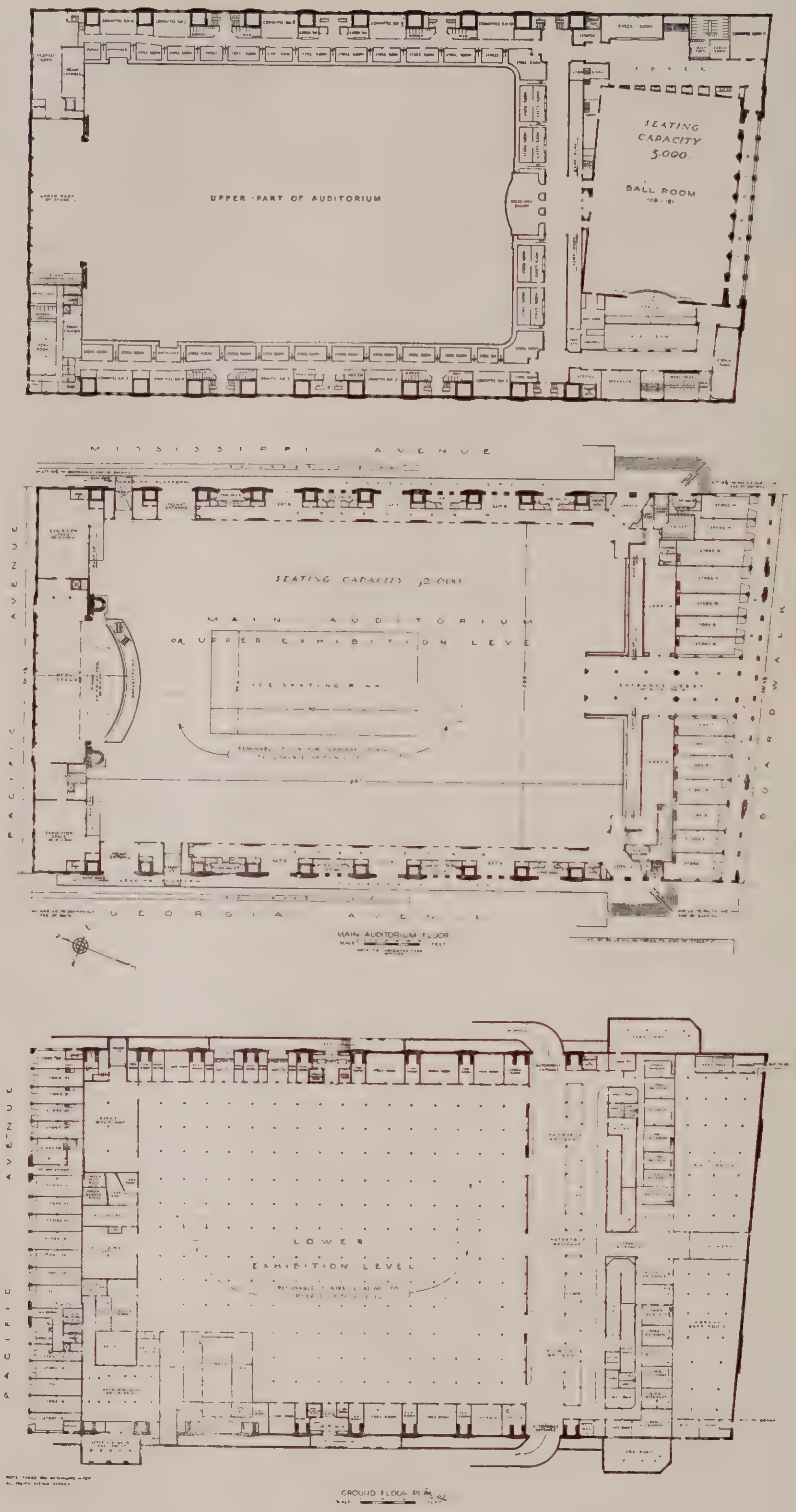
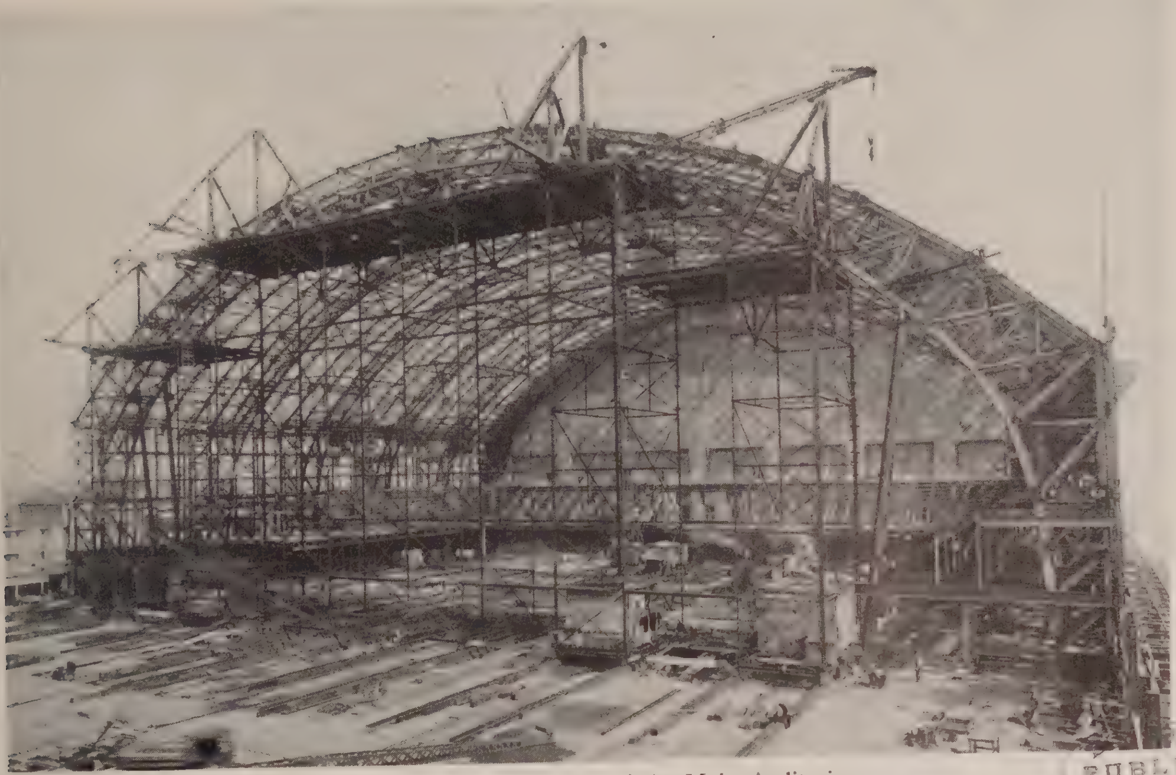
Boardwalk Front of the Atlantic City Convention Hall
Lockwood Greene Engineers, Inc., Architects; Cook & Blount, Associated Architects



DIAGRAMMATIC FLOOR PLANS OF THE ATLANTIC CITY CONVENTION HALL

Lockwood Greene Engineers, Inc., Architects; Cook & Blount, Associated Architects



Erecting the Huge Trusses of the Main Auditorium

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with a similar exit opposite, on Mississippi Avenue. This will allow guests at conventions to arrive and depart without confusion of traffic. Platforms ramping up from the Boardwalk grade extend the full length of the two sides of the building, and serve as exit areas to the auditorium.

The exterior walls of the headhouse are of Indiana limestone backed up with 8 inches of solid brick and 4 inches of hollow brick supported on a steel frame. The remaining portion of the building is faced with a buff brick. The exterior design is a modern adaptation of the Romanesque, incorporating therein the spirit of Atlantic City. The building is of first class construction throughout, short span concrete slabs with steel frame. The basement floor is built at the level of the ground water, grade +2.0. The grade of the ocean adjacent to this site is zero for mean low water and +3.5 for mean high water. The maximum grade of the ocean recorded in the most severe storms has been +10.0. The construction of the basement and the boiler room, which is 15 feet below the basement, was designed for a full hydrostatic pressure, with water at +5.0.

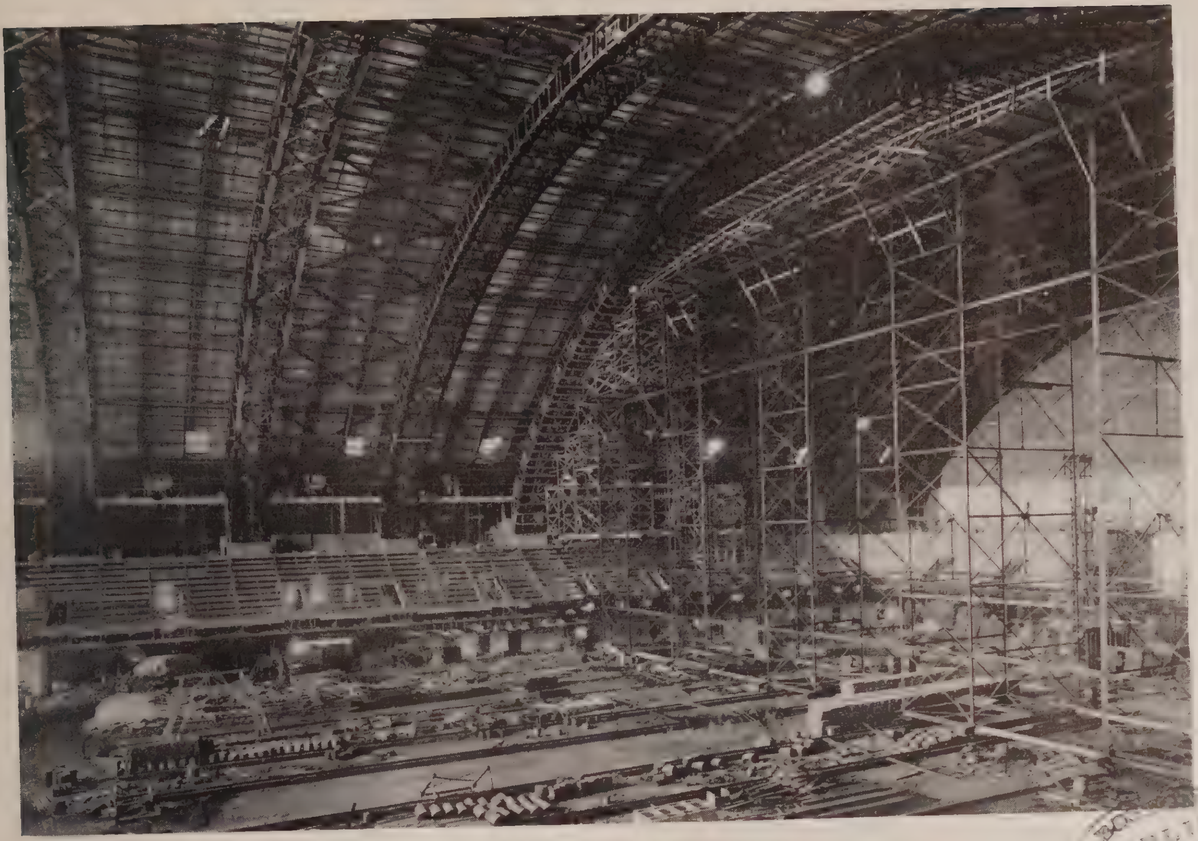
The character of the soil is a fine sand extending to an unknown depth. The foundation was built on 20,000 piles 30 feet long with a minimum butt of 12 inches. The capacity of the piles was taken as 15 tons. This capacity was not derived from any formula, since in this soil it is impossible to drive piles to resistance; 15 tons per pile was established by previous load tests. There have been many buildings built in this vicinity on spread footings, but it was considered advisable in this case that piles be used, as the beach at this particular locality is building up from year to year, and the level of the ground water is likely to change. In order to eliminate hazard of settlement by the lowering of the ground water grade from any cause, it was deemed wise to use piles. Piles were driven by water-jetting to within 2 feet of their final position. A day or more was allowed for the sand to settle around the piles, and then they were driven the last 2 feet by steam hammers. This eliminated the possibility of there being water or air pockets at the tips of the piles. In order to lower the ground water for the excavation of the basement and for pile driving work, a wellpoint system of piping was installed over the entire site. The natural grade of the site was +10.0. Two thousand feet of main 6-inch pipe were laid on the four sides of the site, with 20,000 feet of secondary lines of 3-inch pipe.

During the excavation of the boiler room, which is 25 feet below the street, two levels and in some cases three of wellpointing were necessary in order to efficiently operate the pumps. Piles were spaced 2 feet, 6 inches on centers. No trouble was experienced in accurately spacing the piles and driving them straight by the water-jetting method in the type of soil encountered. The basement or ground floor was designed for a 125-pound live load and a hydrostatic pressure of 3 feet at the level of the floor. The construction consists of concrete beams and slabs. The beams were tied to the concrete mats of the pile foundations by hairpin dowels in order to help resist the hydrostatic pressure. Wood forms were used for the beams. The sand was properly graded between beams and acted as a form for the concrete slabs. Beams and slabs were poured in one operation. Hydrolithic waterproofing was applied over the entire basement. No expansion joints were used. Special care was employed at pouring joints to insure good bonding of concrete. The floor was heavily reinforced for temperature, and has thus far shown no visible cracks. The boiler room was one of the most difficult parts of design and construction in the entire project. The boiler room floor grade is —15.5, with a calculated hydrostatic head of 20 feet, 6 inches. The action of the fine sand saturated with water proved to be of such instability that the boiler room might as well have been built in the ocean, except for the use of the wellpoint system. When the water was lowered to a sufficient depth by use of the wellpoint system, the sand was easily handled and would stand without shoring to a height of from 15 to 20 feet. The boiler room was large, and there were few interior points of support available to resist the hydrostatic pressure. It was necessary to build a 7-foot slab to resist most of this pressure by its own dead weight. It was found by tests that the piles exerted an appreciable resistance to uplift. This resistance was not figured in the calculations and was considered only as a factor of safety. Here again no expansion joints are made, and large percentages of temperature steel were used. Steel reinforcement for the basement, the walls and the boiler room amounts to 1,500 tons.

Concrete walls are used up to the level of the main auditorium floor, grade 18.0, and in the headhouse portion to the Boardwalk grade. The superstructure consists of the first, second, third floors and roof of the headhouse, grades 18.0, 36.0, 48.0 and 62.0, respectively, the main auditorium floor, grade 18.0, with side balconies. All curtain side walls are supported by steel columns and spandrels, and the main roof of the auditorium is supported by ten pairs of three-hinged arches. The floors of the headhouse have no special features except for a few trusses which support the main ramps and upper and lower levels of the end balcony of the main auditorium. These trusses were built up of "C. B." sections (Carnegie beams), and this is probably one of the first instances of their use in trusses.

The cast steel pedestals supporting the main auditorium roof trusses rest on 4 x 8-foot concrete piers which are 20 feet high, the tops being 2 feet below the auditorium floor. The ties for the bottom pins of the auditorium trusses form a part of the first floor framing. The truss ties were designed for a 270,000-pound tension plus the bending stress from the dead and live loads of the floor. Particular study of the splices was made by the fabricators of the ties of the trusses because of their excessive length. They furnished sub-punched tie plates at the third points so that they could be adjusted in the field and drilled to fit. These ties in all cases run over the tops of one-story columns to avoid tension in rivet heads. They also furnished ⅛-inch filler plates for connection angles for adjustment in erection in other places. The ties were designed for a low combined stress in order to obtain a low strain. It so happened in the process of construction that the floor steel was completely riveted and the concrete poured before the load of the truss was imposed on the ties. It was found that when the ties assumed the stress of the truss load, movement was experienced at the roller end of the truss; ¼ inch was found to be the maximum.

Leaving the construction of the auditorium for a moment, attention is called to the end walls of the auditorium. The tremendous wind pressure of these end walls was a special problem to meet. On the front walls the vertical columns were supported at the bottom at the grade of the headhouse roof, and the top at the bottom chord of the main auditorium trusses. The bottom reaction of the wall columns was transferred to the row of columns at each end of the ball room of the headhouse by a flat truss in the plane of the headhouse roof, and in turn transmitted by portal bracing to the foundation. The wind pressure of the Pacific Avenue wall of the auditorium was taken care of in a similar manner. Cross bracing instead of portal bracing was used in the row of columns each side of the stage to carry the wind loads down to the foundation. The main auditorium trusses were of a three-hinged type, 334 feet, 3¼ inches pin to pin with a rise of 136 feet, 4½ inches. They had a 7-inch diameter crown pin and an 8½-inch bottom pin. The chord members were of a tee section with an 18-inch stem plate, two 8 x 8 angles, and one or more 18-inch flange plates. The compression web members at alternate panel points where purlins occurred consisted of four angles and two angles at intermediate panel points. Tension web members consisted of two angles. The tee section type of chord worked out very satisfactorily. The use of large gussets was eliminated, and use of secondary stresses was minimized. The general shape of the truss is a curve, and it is made up of a series of straight members chang-



Interior During Construction Showing Movable Scaffolding

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ing direction at alternate panel points where splices occur. No abutting compression members were employed, the transmission of stress at all points being done entirely by rivets. One-inch rivets were used at the truss joints and $\frac{7}{8}$-inch rivets for bracing connections. Here again particular care was taken by the fabricators in the manufacture of these trusses. All materials of the trusses were sub-punched $\frac{1}{4}$ inch smaller. Half of each truss was laid on the assembly racks to ordinates of the curvature, bolted together and properly reamed to size. For ten pairs of trusses it is realized that this work involved the setting up and assembly of 40 units.

Referring to the former mention of the end walls of the auditorium, the top support of the wall columns was provided with a sliding connection to the bottom chord of the end trusses. These sliding joints allowed horizontal and vertical movement between the tops of the columns, which were embedded in the brick wall, and the truss chords, which are free to move under varying temperatures. It is to be realized that the trusses, wind bracing and cross bracing between pairs of trusses are independent of all other steel framing and brick walls. At the intersection of the walls and the ceiling soffit of the trusses, joints of copper sheets were installed to allow for movement at these points. The trusses were designed in pairs 10 feet on centers and the pairs 49 feet, 2 inches on centers. Purlin trusses 39 feet, 2 inches long and 3 feet, 6 inches deep are spaced 24 feet on centers and come at every other panel point. Jack rafters, 15-inch I-beams, are framed to the purlins at the third points. Secondary 7-inch channels, 6 feet on centers receive the 3-inch solid gypsum roof slab.

In order to provide lateral support for wind pressure at the upper ends of the columns in the end walls of the auditorium, where the sliding joints occur, two sets of cross bracing in the plane of the upper chords of the trusses were employed in the first and fourth bays at each end of the roof. Each set is destined to take half the wind load of the upper portion of the end wall. It was afterwards deemed advisable to install for erection purposes additional cross bracing in the second bay from each end of the roof, thus obtaining a system of bracing approximately 100 feet in depth for the first three pairs of trusses erected. Wire guys were used and maintained until these first three pairs of trusses were erected and riveted, and the cross bracing 50 per cent riveted. This bracing consists of 6 x 4 angles flush with the plane of the roof and spliced with gussets at the intersections of the jack rafters and the truss chords. The interior bracing in the pairs of trusses consists of one 5 x $3\frac{1}{2}$ x $\frac{3}{8}$

angle for tension and two 5 x 3½ x ⅜ angles for compression members. This cross bracing occurred in the horizontal planes of top and bottom chords of the trusses and in vertical planes at every panel point. Six towers were used for the erection of the trusses. Trusses were assembled in place in 24-foot lengths and bracing connected as the work progressed. They were completely riveted to within eight panel points of the crown pin, the remainder being half bolted and half pinned and all the bracing bolted before the erection towers were removed.

The only point of deflection necessary to observe was at the haunch of the truss, at which point there was allowed a clearance between the auditorium wall and the trusses. The deflection of the trusses at the haunch point for the dead load was figured to be, by the method of internal work of distortion, 2 inches. Careful tests were made during the erection of the trusses. Three measurements were taken, first with the weight of the trusses alone, second with the filling-in framing of the roof, and third with the roof covering of 3-inch gypsum. These measurements averaged 1½, 1¾ and 2 inches, respectively, thus indicating that the theoretical deflection checked with the actual.

The heating and ventilating systems, particularly the ventilating of the main auditorium, furnished a problem of unprecedented size. This is indicated by the number and capacity of the fans which it was considered necessary to install, —106 fans supplying a minimum of 746,000 cubic feet of fresh air and exhausting 1,140,000 cubic feet of vitiated air. All the fresh air is heated by indirect heaters having an aggregate surface of about 44,000 square feet. In addition to the indirect heaters, there are 16 window type unit heaters and ventilators for entrance vestibules, and a total of 30,000 square feet of direct radiation.

The ventilation of the auditorium was designed on the basis of upward air movement. In order to understand the arrangement of the apparatus to give this circulation, some features of the design of the building should be known. The roof of the auditorium is supported on ten double trusses spaced 49 feet on centers, each truss consisting of two members on 8-foot centers. These trusses are in the form of three-hinged arches spanning 350 feet and weighing 220 tons to each pair. The trusses rise vertically for about 70 feet before curving toward the center of the building. At this elevation, space was available for fan rooms, and the main supply and vent fans are located here. There is accordingly at each truss on both sides of the building, 70 feet above the street, a double fan room, one part containing a fresh air fan and heaters, and the other an exhaust fan. The fresh air supply is drawn through a circular opening in the outside wall about 75 feet above the street, passing through the indirect heater and into the fan. The fan stands directly over the space between the truss members and discharges vertically downward, utilizing the space in the truss as a duct. At the level of the balcony floor the truss is baffled off and the air diverted into ducts terminating in grilles along the edge of the balcony and along the side wall of the auditorium below the balcony. The supply fans, 16 in number, are of 31,000-c.f.m. capacity, double-width, double-inlet, silentvane type, operating at 382 r.p.m. with 10 h.p. variable speed, remote-control motors and texrope drives. The vent fan in the other part of the truss fan room draws its air from the truss space as does the supply fan, but it extends above the fan room level, in the ceiling of the auditorium.

In the sides of the beams formed by the trusses there are openings, some of which are used for lighting apparatus and others for inlets from the auditorium to the vent duct. The vent fans, 18 in number, are of 40,000-c.f.m. capacity, double-width, double-inlet, multivane type, operating at 162 r.p.m. with 7½ h.p. variable speed, remote-control motors and texrope drives. The vent fans discharge through pent houses on the roof behind the parapet wall. In addition to the main vent fans there are two 5,000-foot propeller fans at the peak of each truss exhausting directly from the top of the room. These fans have constant speed, remote-control motors and are considered an important feature in the proper ventilation of the auditorium, particularly for the summer. Recirculating arrangements are provided for the fresh air fans so that ordinary heating operations will be on an economical basis. These main auditorium supply and vent fans, as here described, constitute the major part of the heating and ventilating equipment. It is of great importance that the ventilation and temperature be properly controlled, because the success of a convention is largely dependent on physical comfort.

The ventilation of the exhibition and garage space in the first story below the main auditorium, presented a considerable problem on account of the large amount of automobile engine exhaust and the relatively low headroom. The data obtained during experiments for the Holland Tunnel were used as the basis for determining suitable quantities of air supply and exhaust. The fan rooms are adjacent to the outside walls. There are two fresh air supply fans with heaters, each fan being of 40,000-c.f.m. capacity, multivane type, double inlet, double width, 206 r.p.m. with 15 h.p. variable speed motor. These two fans are on opposite sides of the room, draw their air from above the marquise, and discharge into

Pouring Concrete Footings over Piles

transverse ceiling ducts connecting in the center of the room to a longitudinal duct which is 40 feet wide by 2 feet deep. It could not be made deeper on account of restrictions of headroom. Outlets into the room are in the bottom of this duct at regular intervals. The exhaust fans are 11 in number, 6 in fan rooms along Mississippi Avenue, and 5 along Georgia Avenue. Each of these fans is a single-inlet, single-width multivane of 12,000-c.f.m. capacity, drawing direct from the side of the exhibition room, through grilles near the floor.

The ball room supply fans are three in number, located in the space above the loggia and discharging into the room through grilles along the edge of the balcony, in the columns along the loggia side, and under the stage. One of these fans is of 25,000-c.f.m. capacity, and the others are of 28,500-c.f.m. each. There are five vent fans each of 15,000-c.f.m. capacity exhausting through 50 small arched openings around the upper part of the room, these openings being provided with pneumatic dampers with remote control. There are also in the ball room about 2,700 square feet of concealed direct radiation.

The boiler plant is located near the Pacific and Georgia Avenue corner, occupying a depressed section of floor, with the pump room and the electrical equipment room. Atlantic City datum is El. 0.0 for mean low water. Mean high water is El. +4.83. The ground floor of the convention hall is El. +2.0, the auditorium floor El. +18.0, and the boiler room El. —15.0. The boiler room extends up through the ground floor to the auditorium floor level, thus having a total height of 33 feet. The excavation for the boiler room is the largest and deepest of any building in Atlantic City, and was protected and kept dry during excavation by a wellpoint system. All concrete below high water level has been waterproofed, and every precaution was taken to prevent any puncturing of the membrane by equipment supports or anchors. Under the boilers, the waterproofing is protected against the heat of the furnaces by hollow tile floor construction, through which air will circulate when the boilers are operating. The anticipated maximum load on the boiler plant is about 3,500 boiler h.p. This load will be reached only a few times a year, and it is planned to carry it as a high overload on the boilers, thus conserving the investment for boilers and boiler equipment. Three water tube boilers have been installed, one of 270 h.p. size and two of 610 h.p. each. The smaller boiler is intended to carry the summer load, providing steam for heating water and other building services. All three boilers at about 225 per cent of rating will carry the winter peak.

Fuel oil is received in tank cars and unloaded by gravity into the storage tanks buried under the platform on the Georgia Avenue side. An excavation has also been made for coal storage in case oil should at any time cease to be available. Oil was chosen as fuel for this building after thorough consideration of its relative costs and advantages as compared to small size anthracite, which is the fuel generally used in Atlantic City. The oil burners are of the steam atomizing type, two burners for the small boiler, and six for each large boiler. They have full automatic control for oil, steam and air flow. The boilers operate at 100 pounds pressure. Feed pumps are duplex, piston pattern, two size 12 x 8 x 12 and one size 7½ x 5 x 6. The feed water heater is a combination open heater and receiver, having storage capacity for 1,800 gallons of water. The fuel oil pumps are duplex steam pumps with exhaust steam oil heaters. As a starting-up unit an electric pump and electric oil heater are provided. Feed water controllers have been furnished for each boiler, and excess pressure governors for each feed pump. Instruments in the boiler room include fuel oil meters, recording and integrating flow meters, and 2-point draft gauges on each boiler, and feed water thermometer.

Steam Distribution and Control. The steam distribution from the boiler room to the building is accomplished by an 8-inch high pressure steam loop, making the circuit of the entire first story. Each indirect heater for the auditorium has a steam supply connection to this loop, with reducing valve at the heater for 15 pounds' pressure. The unit heater and direct radiator systems are divided into three main groups, each with its reducing valves and low pressure mains. Returns are collected in three pump rooms located as nearly centrally as possible to the group of radiators served. Each pump room contains two motor-driven vacuum pumps and two condensation return pumps. The vacuum pumps discharge into the receivers of the return pumps, which are vented, and these discharge back to the feed water heater at the boiler room.

Temperature Control. A very complete system of temperature control has been provided applying to both the direct and indirect heating systems. Use is made of a method for controlling the main auditorium temperature and for keeping alternate blasts of cold and warm air from the fresh air fans. Eight compound thermostats are provided, two on each side wall, two under the musicians' balcony, and one at each side of the stage. These thermostats control individual and in some cases groups of heaters. In addition to the room thermostats there are provided two-point intermediate acting pilot duct thermostats acting on the diaphragm valves of the fan heaters. During the warming-up period the room thermostats are in control and the duct thermostats inactive. When the hall reaches the desired temperature, the room thermostats act to close the diaphragm valves on the heaters. The control is then automatically referred to the duct thermostats, which by controlling the diaphragm valves prevent the air from dropping below a predetermined air temperature.

Control of the heating and ventilating systems is centralized at two points,—first, the engineers' room, adjacent to the boiler room, controlling the auditorium, garage and other departments in this end of the building, and second, the utility room near the Boardwalk end, controlling the ball room and front portion of the building. The remote control switches on supply and vent fans and the pneumatically controlled dampers are centralized in these rooms. An electrically operated temperature indicating system enables the operator to determine instantly and at any time the temperatures at 117 locations within the building, thus making possible an intelligent manipulation of the control features.

Fire protection equipment consists of automatic sprinklers with hose standpipes and roof nozzles. The primary water supply is the city water system, and the secondary supply a 150,000-gallon reservoir adjacent to pump room and 12,000- and 20,000-gallon elevated sprinkler tanks in the Boardwalk and Pacific Avenue ends of the building. Automatic sprinklers are provided for the entire first story, for all store basements, storerooms, auditorium and ball room, stages, proscenium arches, and dressing and chorus rooms. The static pressure on the city water system is 40 pounds, but the residual pressure is only 15 pounds. Neither of these pressures is sufficient to supply water to the sprinklers in the higher parts of the building, and consequently the automatic fire pump now to be described is necessary to make the primary supply available at these heads. A cast iron main, of partly 8 inches and partly 10 inches, was laid in the streets forming a loop around three sides of the building, and connected to the city mains through check valves at three points.

Two 1,000-gallon Underwriter pumps are located in the pump room near the boiler room and adjacent to the reservoir to which their suction pipes are connected. One pump is a motor-driven, centrifugal unit, and the other a duplex reciprocating pump size 18 x 10 x 12 with an auxiliary pump size 4½ x 2¾ x 4, both with automatic governors. The auxiliary pump operates under control of its governor to maintain full pressure on the system up to the highest sprinklers. If a sprinkler head should open or any flow of water occur beyond the capacity of the auxiliary pump, the main pump will immediately start up, and its 1,000 gallons per minute capacity would be available. The fire pump supply reservoir is kept full by a 6-inch pipe with float valve direct from the city water mains.

The Convention Hall with its equipment was designed by the Architectural and Engineering Departments of Lockwood, Greene & Co., Inc., Walter W. Cook, Chief Architect, and Alexander H. Nelson, of Atlantic City, Associated Engineer.

WALL STREET ENTERS THE BUILDING FIELD

BY

JOHN TAYLOR BOYD, JR.

PART III

IN the new type of building finance, stocks constitute an important feature. Stocks, particularly common stocks, are a much more variable and difficult factor to deal with than bonds, and in order to sell stocks effectively,—and bonds too for that matter,—to the public, a quick, active, and free market, such as only a securities exchange can provide, is necessary. This is one of several reasons that have prompted the Real Estate Board of New York to establish a special exchange for dealing in real estate securities of all types. The term "real estate security" will be broadly interpreted, and will include real estate stocks and bonds of various classes and other securities based on real estate properties or on real estate business, or on the financing of real estate transactions. It is expected that the new exchange will be open for business by October 1, 1929, and earlier if possible. The exchange will be located in the New York Real Estate Board building at 12 East 41st Street, just off Fifth Avenue, where the executive offices of the Real Estate Board are located. There will be 250 seats sold at $5,000 each, with yearly dues of $300 per seat, and it is expected that all seats will be sold before the exchange opens.

These seats have been taken up largely by associates of most of the large real estate offices, and a number have been bought by associates of houses represented on both the New York Stock Exchange and the New York Curb Market, and by individuals connected with various financial, construction, promotion and other interests allied to real estate. A constitution has been drawn up modeled closely on that of the New York Stock Exchange, and the same high standards which that body has established to insure the financial responsibility of brokers and strict honesty in trading, will prevail. A schedule of commissions on sales of securities has been established, of which these charges to non-members are samples: (1) On bonds,—not less than $2 per $1000 par value. (2) On stocks,—a sliding scale, including not less than 7½ cents for stocks selling between $1 and $10; stocks selling between $25 and $50, not less than 15 cents; and not less than 20 cents for stocks selling between $75 and $100, etc.

To the company whose securities are listed, a charge will be made of $100 for each $1,000,000 or portion thereof of each class of security including stock of the par value of $100 per share, or where stock is of a par value less than $100 per share or shares without nominal or par value, $100 for each 10,000 shares or portion thereof. There will be no ticker service. A price board will be maintained on the floor of the exchange, on which will be shown quotations of previous closing prices on securities, last sale, and also the number of the post at which the security is traded in. The brokers' offices will obtain these price quotations by telephoning in to the exchange. The New York Stock Exchange has generously placed at the disposal of the new exchange full information as to its own workings and policies.

Among all these innovations of new finance the establishment of this real estate exchange is the most unusual. Its sponsors feel that not only will it benefit real estate generally, but that in several respects it will become an essential part of real estate and construction finance. It should aid in keeping real estate up to date and in making the necessary adjustments to financial developments since the war. No effort is being spared to make the project a success; it has the backing and good will of powerful real estate and construction interests of New York, and influential men in the New York Real Estate Board are making themselves personally responsible for the success of the undertaking. Architects who are interested in construction finance may find it advisable to watch the success of the real estate exchange. A full understanding of its success requires more than a knowledge of its mechanical function in real estate finance. One should grasp the economic function of a securities exchange in the industry of today.

But why, it may be asked, is a new exchange necessary in New York, where there are already three great general securities markets? Why not use these exchanges in some such manner as was illustrated in the case of the U. S. Realty & Improvement Company and the other real estate companies? The answer is that the exchanges dealing with general securities of New York now deal in such large issues that the average real estate issue, placed on a single building, and of less than $1,000,000 in amount, is too small to be handled by them to the best advantage. There are few companies left on the "big board" with common stock issues of less than 1,000,000 shares. Only a huge corporation, such as the U. S. Realty

& Improvement, which is developing a chain of properties for which it needs constantly millions of fresh capital, can make the best use of the New York Stock Exchange. And we have seen how U. S. Realty, in conjunction with the National City Bank, employed the over-the-counter market to float the issue of approximately $4,000,000 on the Beaux-Arts Apartments building. On the "big board," the common shares of the gigantic Equitable Building on lower Broadway, Manhattan, and the bonds of the similarly large Drake Hotel, of Chicago, stand almost alone.

The Curb Market, likewise, deals chiefly in large issues of expanding companies, generally new issues, many of which, after a process of "seasoning," find their way eventually to the Stock Exchange. We have seen how most of the group of newer real estate development companies herein described, and their construction subsidiaries, have used the Curb Market for their shares. As regards the over-the-counter market, it is true that a rather small number of the largest mortgage bond issues, based on well known huge buildings, have a market there, but even these large issues,—large from the point of view of the building industry,—seem insignificant in size and are easily overlooked by the public. Also, another drawback is that the big Wall Street investment houses are not much interested in an issue of less than $1,000,000. They are organized to handle larger issues, preferably of $10,000,000 or more. The smaller Wall Street houses which will accept the small real estate issue lack the widespread distribution of their large rivals, and their selling costs are likely to be comparatively high. Real estate, therefore, needs its own securities exchange where its smaller issues of $1,000,000 or less will not be dwarfed.

Architects outside New York might consider the possible value to the building industry of the stock exchanges in the other large cities of the country,—Chicago, San Francisco, Los Angeles, Boston, Detroit, Philadelphia, etc. For marketing comparatively small security issues based on local or regional real estate enterprises, these regional securities exchanges might be much more effective than the huge New York general securities markets. They follow the same strict standards as the New York Stock Exchange, and like it, are constantly growing in importance. Though I am not familiar with these exchanges outside New York, it would seem reasonable to suppose that their governing boards would be only too glad to coöperate with the local building industry in encouraging the listing of its securities. Individual building organizations might seek a listing for their issues, or the leaders of the local building industry might consider an approach modeled somewhat on the action of the Real Estate Board of New York in establishing its own exchange. In localities where this does not seem practicable, the leaders of real estate and construction interests, including the architects, might actively sponsor a special section of real estate securities in their local stock exchange.

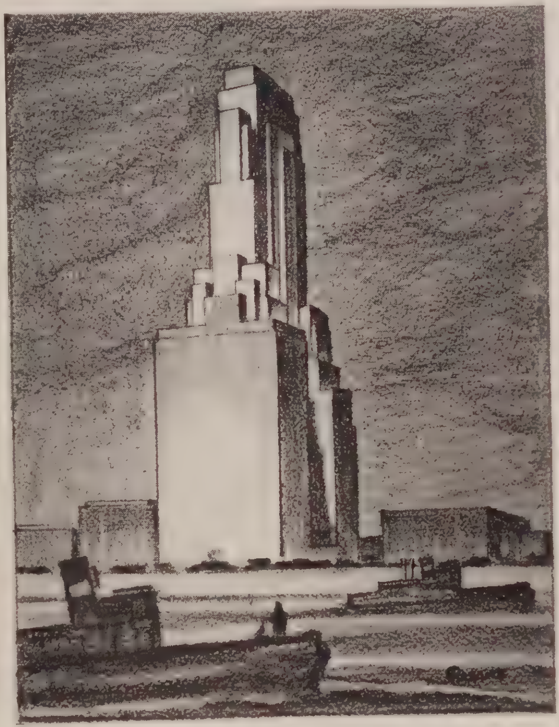
For it is important to bear in mind that there are grave dangers in introducing to the public a large group of new "unseasoned" securities. A wild speculation, such as took place recently in the new aviation and amusement securities and in various "specialties," is something to avoid if possible. In real estate we have had quite enough of that sort of thing already. Anyone can think of certain nimble gentlemen who would be quick to seize the opportunity offered in the new finance, to unload bushels of worthless paper on the public. The building industry does not want a repetition of the mortgage bond failures of a few years ago. In fact, the sponsors of the New York Real Estate Exchange had just this condition in mind when they decided to create a special real estate exchange. The fullest publicity will be given to the finances of the companies whose securities are traded in, to aid the careful investor in picking out sound securities.

We have seen how the New York Stock Exchange enforces a high standard of publicity as to the finances of the companies whose issues are listed. This is the only means so far devised of protecting the individual investor and of reducing the evils of manipulation of security prices as far as is possible without interfering with a free market. The new real estate exchange will carry this principle even further in one respect,—by subjecting, as a requirement for listing, the real estate properties on which a security is issued to the independent appraisal of the exchange's official appraisal committee. This novel proposal has excited much interest. It does not mean that the exchange will endeavor to fix the price of a security by making public an estimate of the value of the property. That would interfere with a free market, and besides, since appraisal must be in some degree a matter of opinion, there could be no assurance that the exchange's appraisal, however expert, would be 100 per cent correct. What it means is that the exchange will not publish the appraisal but instead will make public the financial statement of the company applying for listing, and will announce that the properties of the company have been appraised by the exchange's committee on appraisal and have been judged suitable for listing. Annual statements of the company's condition will be required, and the company is further obligated to report to the exchange any changes in its financial affairs which will modify the official appraisal. These arrangements will aid the public to establish fair prices for securities in trading.

Such a standard of complete, periodic and responsible publicity of finances may be painful to certain elements of the building industry, but it is in line with modern financial policy which recognizes that the investor has a right to know what he is buying. Organizations which wish privacy for one or another reason are at liberty to avoid this real estate (or any other) exchange; but it is possible that they will find it increasingly difficult to raise capital in other directions.

The new exchange will follow precedent in taking full precautions to ensure the financial responsibility of the brokers. Its committee on business conduct has the right to investigate the dealings, transactions and financial conditions of members and to examine their books and papers at any time. This right the New York Stock Exchange exercises with greatest severity. Recently it expelled a member because its auditors discovered that he had defrauded the government in filing his income tax return. It was argued that such a man could not be trusted with customers' money. Where transactions are closed by word of mouth,—although "comparisons" of the records are made afterward to ensure accuracy,—the standard of honesty must be absolute for the protection of both brokers and the public. One clear case of crooked dealing or failure to live up to an agreement, and a man is done. As a result of this discipline, the New York Stock Exchange has not had a financial failure among its members in a couple of years,—a record that is not approached even by the banking systems of the country.

Such, in general, are the plans for the new real estate securities exchange, designed to serve the needs of the building industry. Its backers have been considering the project for 14 years, when the idea originated in the desire to free the industry from the grave abuses resulting from extravagant appraisals, this being the chief cause of foreclosures resulting in heavy losses to the public, particularly to those in the "widow and orphan" class, whose patronage the building industry has always sought. These influential New York realtors were alarmed at the disclosure of the conditions attendant upon the crash of a large nationally known mortgage bond house not many years ago, and they resented bitterly the very recent collapse of certain huge buildings,—the financial collapse, of course, because the properties were of the finest architectural standard and were excellently located,—but they could not stand up under the overload of inflated issues.



A Real Estate Exchange Might Market the Securities for a Huge Combination Store, Office Building and Apartment House Such as this Proposed Battery Tower, New York

Thompson & Churchill, Architects

All finance today places great emphasis on the collateral value of a security. In this connection the promoters of the New York Real Estate Board Exchange were somewhat surprised at receiving hundreds of letters from all sections of the country approving their project soon after its announcement. They looked into this aspect and discovered that both bankers and investors were impressed with the need for collateral value in real estate securities, such as only a securities exchange can supply and approve. Suppose, for example, that a man in Tulsa approaches his banker for a loan of $10,000 to build himself a home. He offers as security $15,000 par value of mortgage bonds issued on a big New York office building on Fifth Avenue. But the banker is embarrassed to inform him that the bonds won't do because there is no quick, sure market to sell them in the event the loan turned "sour," and in fact that there is no information available on which to form an opinion as to what the bonds are actually worth. So the bank cannot accept a good business deal, the man can't build a home, and the building industry loses a desirable customer,—all because the real estate bonds have no standing as collateral. This is an illustration of the advantage of establishing collateral value in a security. Today loans made on good stock exchange collateral are coming into favor for financing all sorts of business transactions. Banks favor this type of loan because it is by far the safest,—one of the easiest to make, and one that is satisfactory to the customer. This is one reason why many investors favor stock exchange securities.

It may also be said that the sponsors of the real estate exchange are alive to the implications of the new method of construction finance, and the radical changes in economic conditions on which it is based. "The day of the small real estate holding is passed," is a statement they have made on several occasions. "We must take the public into the ownership of real estate. These buildings are getting so large that there is no other way to finance them." A block building proposition becomes a public affair because no one man or syndicate can swing it. Since there are always uses for the small building, the chain principle of ownership may find opportunity in that field, and create another demand for large-scale financing.

This brings us to a brief consideration of the economic function of a stock exchange and its peculiar relationship to common stock issues. Especially is it necessary to form a clear idea of the difference between speculation and investment which will be considered later. This is essential in working out any specific plan of building finance. It is well to avoid becoming involved in the present controversy over the unprecedented speculation on the security exchanges of the nation. The situation seems much too involved for an architect to understand, since some of the greatest financial authorities of the world are at odds over it. For this reason, architects should be on their guard against accepting uncritically the opinion that is now being expressed by some of the financial experts in the building industry to the effect that the money which the building industry needs for mortgages and equities is being diverted to speculation in Wall Street. This diversion, it is argued, will injure the industry.

Without attempting to solve such a knotty problem, it may be worth while to point out that the situation in building finance discussed in these articles throws a different light on the problem. Briefly, we have seen how these new financial-construction organizations, like the Beaux-Arts Development Corporation-U. S. Realty-National City combination have gone into Wall Street, to the Stock Exchange, Curb and over-the-counter markets, and have there obtained their junior mortgage and equity financing much more easily, and what is even more important, they got all the money they wanted and got it on much more economical terms than were offered in the conventional method of building finance. I have not heard any of them complain that Wall Street speculation was strangling their business!

It is apparent that there are many reasons besides the alleged reason of get-rich-quick speculators which makes Wall Street attractive to the public. As previously pointed out, the question of the investor, "What do I get out of it?" gives him control of the situation today. But the matter goes even deeper. The claim is made that one of the controlling factors in the situation is the change of the American nation from a debtor to a creditor nation since the war. We now pile up surplus capital so fast that we must have a new and larger channel to conduct the flow of capital away from the many money tanks which might otherwise clog up and burst. The securities exchange provides a needed safety valve, without which the surplus money might be employed in speculation in commodities, in both urban and farm lands, and in the over-expansion of industries, with disastrous effects to general business. This is about as far as an architect can go. Whatever be the truth to economic theory, there is a very practical point for architects to take note of in the situation. They should note carefully the growth of the security exchanges as a primary source of long-term capital, for no one can deny that long-term capital is what the building industry sorely needs. Nor can one deny the fact that the building industry generally has enjoyed the benefit of low-cost, long-term capital only on first mortgages. It has practically never enjoyed that advantage for junior mortgages and equity financing that other industries have.

This brings us to the distinction between investment and speculation. A delightfully amusing incident took place a few months ago when a prominent New York realtor, long noted for his promotion of sub-divisions, publicly attacked Wall Street for having diverted money from real estate investment into stock speculation! This is the view of a clever salesman, and the man who represents his own goods to be "investments" and the other fellow's goods as "speculations!" But this emotional distinction is not of practical use in working out plans of building finance based on stock issues

Without splitting hairs on economic theory, one may accept, as a good workable definition, the theory that investment means solely the purpose of conserving one's principal, neither adding to it nor subtracting from it, but merely drawing interest thereon by lending it to someone else. Examples of investments are life insurance endowment policies or savings bank accounts or very conservative first mortgages. Only on that basis can one be a pure investor. But the moment that one listens to that little devil Appreciation whispering in one's ear, one becomes corrupted by speculation, and to the extent that one acts on his suggestions, one passes from the 100 per cent of security investment toward the opposite pole of 100 per cent of speculation, which is in the nature of gambling.

On the other hand, it is only too evident that speculation can be excessive, particularly in the highly complex, delicately adjusted economic system of today. One may say that speculation becomes excessive when the evil it works overbalances the good it does as an incentive to business activity. In that case speculation does become harmful, although the problem of how to deal with it practically seems almost insoluble.

Understanding these principles is essential in determining the proper proportions of investment and speculation in working up plans for stock issues. The question is of course one of the amount of risk that seems reasonable in each case. Here one may accept the principle that the value of common stocks in the financial practice of today is likely to rest chiefly on intangibles. Common shares values are based chiefly on earning power and on public confidence in the management and in the competitive strength of the enterprise. For example, General Motors has great earning power and strength, but its "book value" is very low. U. S. Steel is also strong in earning power, but has high book value. On the other hand, most of U. S. Steel's surplus is tied up in highly specialized plants and equipment, and it is likely that, if the management failed to make a success of the steel business, no one could be found who would be willing to take over these plants at 100 cents on the dollar. But with real estate stocks, we have seen that they can have great real liquid book value behind them in the form of fine real estate properties, and this should be a valuable investment advantage in this class of security. The "bonus" stocks, which were discussed in the last article, are very interesting in this connection. When issued they represented nothing but expected appreciation in specific real estate properties; hopes of earning power, and of increasing equity value as mortgages or preferred stock were paid back. On the other hand, as an offset to their speculative character, those bonus shares cost nothing, and are a fairer type of investment than "watered" stocks for which real money is paid.

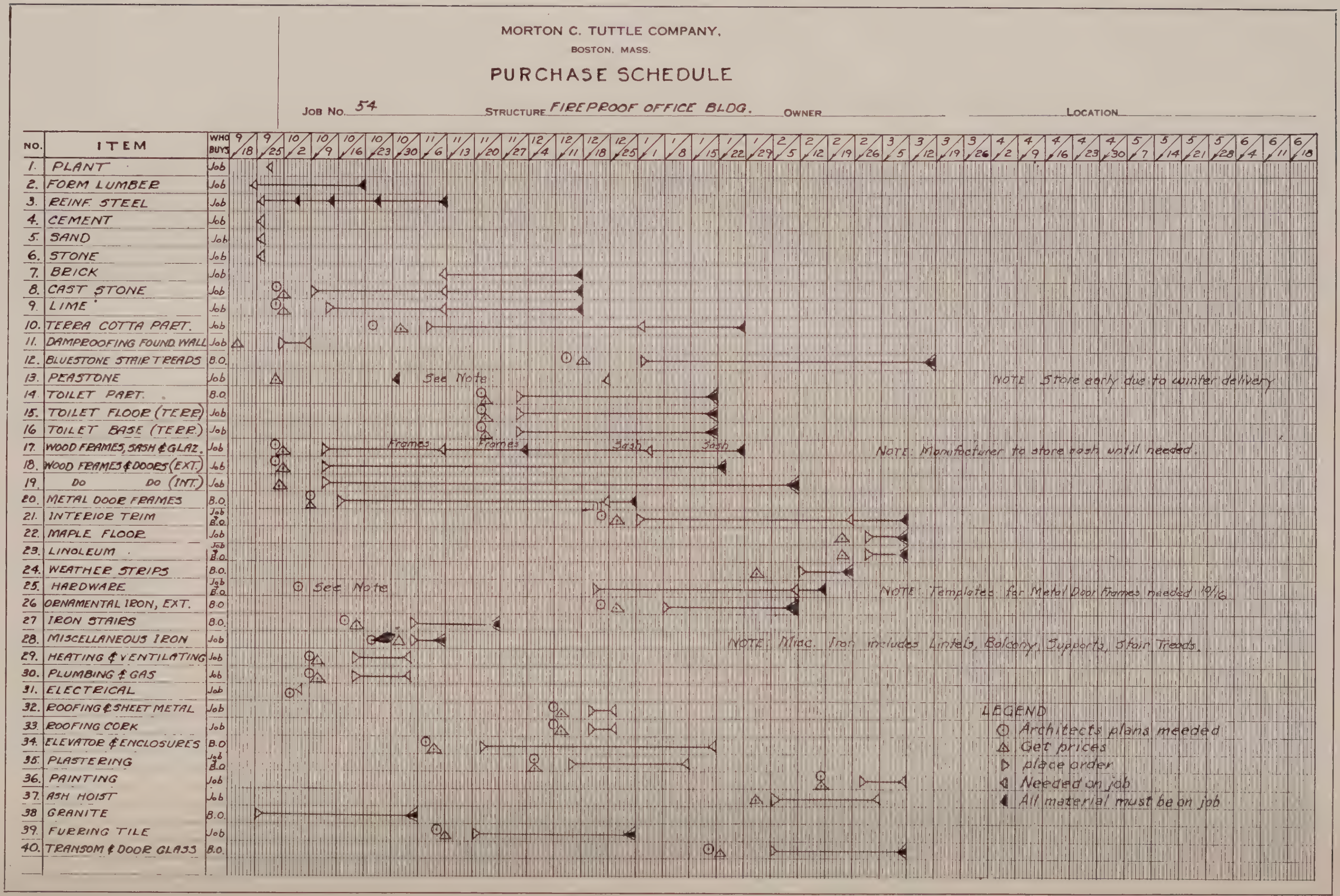
Now, the point of this intangible nature of common stock is that a security exchange provides the only practical yardstick for appraising its values. The prices fixed in the trading represent the consensus of the many different opinions of both public and experts as to the merits of any stock, or in other words, as to the future prospects of the real estate properties on which the stock is issued. Thus in its trading a securities exchange sets a flexible standard for appraising individual stocks and classes of stocks.

This discussion of securities exchanges concludes the account of the new financial developments in the building industry in New York. How different is all this maze of ideas and methods from the good old fashioned plans of building finance! Actually, for years there has been only one plan in building finance. Set the equity and, that done, the choice of two or three possible mortgage alternatives became almost automatic! Such has been the formula for 50 years.

But, from a historical point of view, the placing of junior and equity financing on the basis of long-term security issues seems plausible. It merely completes the transition begun 40 or 50 years ago when the existing elaborate system of first mortgage loans replaced the ancient practices of "private" finance. Up to that time the mortgage and title business rested chiefly in the hands of small individual capitalists, executors of estates, and brokers and lawyers acting for clients. It was costly, inefficient, none too responsible, and was not without its abuses. The needs of the building industry had grown beyond this small scale, uncertain traffic, and accordingly the first mortgage business was organized into a system of public large scale finance, operated by large mortgage and title companies, insurance companies, savings banks and building loan associations, all of which drew funds from the general public for first mortgages in almost unlimited amounts. But since that time nothing has been done for junior and equity financing. Now, after 50 years, that final step may at last be taken. If the movement continues, we may witness further changes in the first mortgage system itself,—possibly greater flexibility and a tendency to obliterate the sharp lines of cleavage which now separate mortgages from equity financing. This latter change was made in the Beaux-Arts financing, as has been described.

The use of security exchanges may become of greater importance in finance. The trend of general finance today is to seek capital from the public as a principal source. Real estate, which has existed more or less as a world apart, with its own peculiar system and customs of finance, may not be able much longer to avoid the change. It may be obliged increasingly to compete with other industries for its share of the surplus capital of the American public in the public securities markets. The Real Estate Board of New York Exchange may prove a valuable aid in making the change.

Such are the possibilities of an interesting and important situation, new and amazingly complex. One sure fact, however, stands out strongly in the uncertainty, like a tower. That is, the crying need of the building industry for the economy of long-term financing of junior mortgages and equities of buildings.



MORTON C. TUTTLE COMPANY,
BOSTON, MASS.

PURCHASE SCHEDULE

JOB NO. 54 STRUCTURE FIREPROOF OFFICE BLDG. OWNER LOCATION

NO.	ITEM	WHO BUYS
1.	PLANT	Job
2.	FORM LUMBER	Job
3.	REINF. STEEL	Job
4.	CEMENT	Job
5.	SAND	Job
6.	STONE	Job
7.	BRICK	Job
8.	CAST STONE	Job
9.	LIME	Job
10.	TERRA COTTA PART.	Job
11.	DAMPPROOFING FOUND. WALL	Job
12.	BLUESTONE STAIR TREADS	B.O.
13.	PEASTONE	Job
14	TOILET PART.	B.O.
15.	TOILET FLOOR (TERR.)	Job
16	TOILET BASE (TERR.)	Job
17.	WOOD FRAMES, SASH & GLAZ.	Job
18.	WOOD FRAMES & DOORS (EXT.)	Job
19.	DO DO (INT.)	Job
20.	METAL DOOR FRAMES	B.O.
21.	INTERIOR TRIM	Job B.O.
22.	MAPLE FLOOR	Job
23.	LINOLEUM	Job B.O.
24.	WEATHER STRIPS	B.O.
25.	HARDWARE	Job B.O.
26	ORNAMENTAL IRON, EXT.	B.O.
27	IRON STAIRS	B.O.
28.	MISCELLANEOUS IRON	Job
29.	HEATING & VENTILATING	Job
30.	PLUMBING & GAS	Job
31.	ELECTRICAL	Job
32.	ROOFING & SHEET METAL	Job
33	ROOFING CORK	Job
34.	ELEVATOR & ENCLOSURES	B.O.
35.	PLASTERING	Job B.O.
36.	PAINTING	Job
37.	ASH HOIST	Job
38	GRANITE	B.O.
39.	FURRING TILE	Job
40.	TRANSOM & DOOR GLASS	B.O.

NOTE Store early due to winter delivery

NOTE: Manufacturer to store sash until needed.

NOTE: Templates for Metal Door Frames needed 10/16

NOTE: Misc. Iron includes Lintels, Balcony, Supports, Stair Treads.

LEGEND
- ⊙ Architects plans needed
- △ Get prices
- ▷ place order
- ◁ Needed on job
- ◀ All material must be on job

This Controlling Purchase Schedule Is Explained on Page 253

CONSTRUCTION CONTROL BY SERVICE CONTRACT

BY

L. M. RICHARDSON

MANAGER OF CONSTRUCTION, MORTON C. TUTTLE COMPANY, BOSTON

THERE are three chief points of interest to the man investing in construction,—first, the efficiency of the work as indicated by organization and method of construction; second, the progress in time; and third, the cost of the work. In the case of a contract placed on the basis of price competition, once an award has been made, the method of operation is entirely in the contractor's hands; the matter of time has been specified and is presumed not to concern the owner until the work is completed, and the cost is, as a matter of choice, entirely in the builder's hands. On this latter point an owner buying a building in competition never knows what the work actually costs. On the other hand, where a contract is placed on a service basis and the builder is selected for his particular ability, while the control of the work and responsibility for it are necessarily in the hands of the builder, it is the owner's privilege to interest himself at all times as far as he may wish in following any phase of the construction.

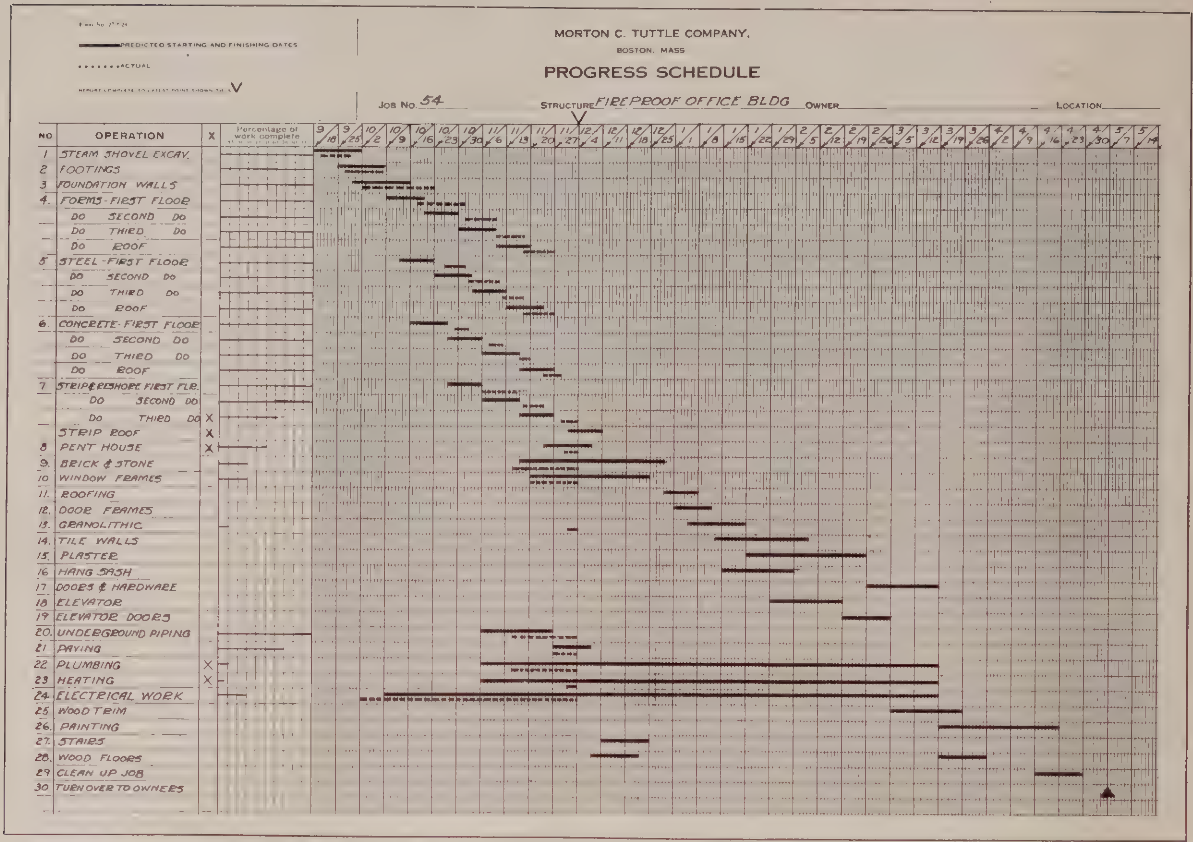
The contractor operating on a service basis naturally counts as his chief asset the good will of his clients, and accordingly he must make every effort to so handle his work that the owner will always find the work proceeding efficiently, with time and cost systematically controlled and periodically recorded. To attain this result, the service builder must pay unusual attention to the selection of his field forces and to the organization of each contract; he must carefully plan the progress of his work to coördinate the various trades, and record progress in such a manner that the time status of the work will at all times be apparent; and, what is of the greatest importance, he must systematically record and follow the cost aspect of the work from every angle to show at all times the actual cost as compared with the original estimate. Because the interests of the owner are paramount in fact as well as in theory, the coöperative aspects of the relation must be carried out in every phase of the operation. The owner's viewpoint must never be lost sight of. Construction procedure, including the systematic recording of cost and progress, must be viewed through his eyes, all records be carried in such manner as to be clear to him rather than in the language of the builder, and a full record in clear, understandable shape always be available to him and to the architect who represents him.

The application of these principles is illustrated in the description here of a construction operation carried out on a service basis. The structure is that referred to in previous articles in THE FORUM, by Morton C. Tuttle (January, 1929), and Clayton W. Mayers of the Morton C. Tuttle Company, Boston (April, 1928), discussing respectively the advantages of collaboration of designer and cost expert and the application of this service in the preliminary stages of a development and prior to starting construction.

The building taken as an example is a fireproof office building, three stories in height, of modified Georgian architecture, with a brick exterior. The entire structural frame of the building is of reinforced concrete with no transverse beams. Reinforced concrete slabs span across the building from side walls to longitudinal beams running lengthwise and located on the lines of the main corridor walls.

Progress Schedule. The basic secret of successful construction may be given almost in a word; it is that of getting the right men and the right materials, in right quantities, at the right place at the right time. *And the essence of all this rightness is time.* Only systematic planning of a building operation before the work starts, including a thorough analysis and careful consideration of each operation involved, can assure completion on a definite, pre-arranged date and guarantee a smoothly coördinated procedure from start to finish. Such planning in the case of the building under discussion is illustrated by the progress schedule produced herewith, showing the time status of the work on November 27, after it had been under way for eleven weeks. This schedule is prepared under the direction of the Manager of Construction from comprehensive records of past experience and is one of the first steps in starting the work, being preceded only by a preliminary survey of local conditions. The schedule is laid out on a printed form with as many columns as there are weeks in the course of the work, each column being headed by the month and day. The original schedule serves as a master sheet and is held in the Company's home office. When completed and finally approved, a number of blue prints are made from it and sent to the field office. Each week the field engineer, whose duty it is to record progress, fills in the schedule up to the current date, and after approval by the field superintendent it is forwarded to the Manager of Construction at the main office. He in turn scrutinizes the schedule and makes such suggestions as field conditions indicate.

Every schedule is based on some one key point, which in this instance was an occupancy date of June 1, desired by the owner. This required the



delivery of the building approximately one month earlier than the final date, to allow the owner sufficient time to install furnishings and make such preliminary preparations as were necessary to assure full occupancy at the desired time. The secondary point in this schedule is November 20, on which date it was desirable to have the concrete frame of the building completed in order to avoid severe weather conditions, with consequent expense, that would undoubtedly be experienced after that date, as the structure is located in northern New England. The schedule was accordingly worked back from November 20, and subsequent operations laid out to show completion on May 1.

It will be noted that this progress schedule lists the various main divisions of the work in the order of construction. These operations are numbered, for convenience of reference, in the first column. Any scheduled item departing more than a day or two from schedule is indicated by a cross in the third column opposite the item. The fourth column is divided to show the percentage of completion of each item and is of particular value as showing at a glance those items which are completed and accordingly require no further attention, and the status of each uncompleted item.

Excavation, the first item in the schedule, was started approximately on time and was completed in slightly less time than had been anticipated. Footings also were completed about as planned. In the case of foundation walls, however, excavation uncovered a more difficult condition than was anticipated, with the result that this item was started three days late, and its completion extended one week beyond the planned time. This naturally delayed the erection of floor forms which, in the case of each floor, were completed about one week later than had been planned. However, because of the desirability of completing the concrete frame as planned, the placing of concrete was accelerated to show completion of each floor in five days rather than the ten days shown, with the result that the concrete roof was in place only two days later than planned.

It is particularly noteworthy that up to this point the progress schedule has served its purpose in indicating each week the exact status of each major operation, and in this case it has shown the steps necessary to bring the work up to time. The removal of forms, covered by Item No. 7, was delayed by the later starting of concrete, but the final removal was not of particular importance once the first story was clear to permit the starting of the brickwork. This brickwork was started on time and was immediately followed by the erection of window frames in order to close in the building as the work progressed. The schedule at this point shows granolithic work just starting, five weeks ahead of schedule. A reconsideration of this item showed the desirability of making an earlier start, since the completion of this item with the paving would also complete all the concrete work of the building.

This schedule, taken at a later point in the work, would usually show more variation than in the earlier stages, due to the fact that it is more difficult to predict the exact progress of the work of equipment installation, which is usually sub-let, and of interior construction. It is accordingly necessary to pay much closer attention to time during the latter half of an operation than in the earlier stages. A copy of this schedule is sent each week to the owner and to the architect. It is also posted at the field office in order that the full field organization may know the rate of accomplishment.

Purchase Schedule. (See page 250). Progress is directly dependent on delivery of material on definite dates, and accordingly the time of delivery of each major item of material must be pre-determined. To accomplish this a purchase schedule, in form similar to the progress chart on which it is based, is prepared immediately after progress is laid out. The purchase schedule on this particular project is reproduced herewith and is generally self-explanatory. In fixing dates for the delivery of various materials consideration is given to sources of supply and, in the case of subcontractors, to the time required for manufacture or fabrication,—this consideration applying to such items as elevators and enclosures, stairs, doors and windows, etc., which show the dates of placing orders somewhat early as compared with other items. In the third column, after each item, will be noted either the letters "B. O." or the word "Job." This column indicates whether purchase of the particular item is to be made by the Boston office of the Company or by the field office on the job. Where both are shown opposite an item, this indicates that local prices will be taken by the job and figures taken by the Boston office as well. In this particular instance the owner wished all orders placed through his own purchasing department, which accounts for practically all purchases being noted as handled by the job. Regardless of the actual placing of the order, all major purchases are made under the supervision of the general purchasing agent at the main office. This purchase schedule shows the date on which plans must be available if purchases are to be completed as required. Therefore, this schedule, in preliminary form, is presented to the architect for his criticism and suggestion and particularly for his assurance that the dates shown for completion of various plans and detail drawings can be met.

Changes in Estimate. The purpose of an estimate on a building operation is not only to show the probable final cost of the work but to serve as a basis for the recording of costs as the work progresses and the comparison of unit costs with estimated cost as the work proceeds. Although the estimate on which the award of this particular building was made was a close approximation and sufficient to show the amount of the investment involved, it had been based only on preliminary sketches and was not sufficiently accurate to serve as a basis for the field accountant. Accordingly, as soon as plans were sufficiently developed, a revised estimate was prepared and submitted to the architect for his approval, and when approved a copy sent to the owner for his information. In developing this estimate the units used are not general assumptions based on past experience but rather exact unit costs taken from work of a similar character. This is made possible by the operation of the cost accounting system, described here, which makes available in usable form the detailed costs obtained on each contract carried out. Tabulated in simple form, these costs are always available as an up-to-date source of accurate estimating data.

Job Budget. In order that the field forces may be fully informed as to the expected cost accomplishment on the work, the job office is furnished with a budget taken directly from the estimate, but unlike the estimate it is split up into two sections,—labor cost and materials' cost. This budget in preliminary form was made up immediately following the completion of the estimate in order to give a basis for the field cost accounting. As soon as plans were finally completed and the purchases made, a revised budget was prepared which showed numerous changes in various details but little change in the total amount. The total amount shown in labor and material budget is somewhat less than the total of the estimate, since the estimate carries a 5 per cent contingent item which is not shown in the budget. The first column in the labor budget shows the code classification for each item.

JOB BUDGET
for
A FIREPROOF OFFICE BUILDING
IN NEW ENGLAND

LABOR

Excavation		Quantity	@	Total
Das	Clear site (cut trees and dig roots)			$150
Dass	Steam shovel excavation........	1,800 c. y.	$0.22	396
Dass-T	Team excavation...............	1,800 c. y.	.50	900
Dah	General hand excavation behind steam shovel..................	150 c. y.	.80	120
Dad	Hand excavation for footings, walls and pits......................	300 c. y.	1.75	525
Ded	Backfill footings and walls........	500 c. y.	.75	375
Dap	Level and tamp for paving.......	6,700 s. f.	.02	134
Deg	General grading 10′ from building			200

(JOB BUDGET, CONTINUED)

Plant

		Quantity	@	Total
Peu	Unload and reload all plant	(Teams separate)		$1,800
Pen	Temporary buildings			
Pes	Sawmill			
Pew	Temporary water, heat and fuel			
Pem	Mixer and motor			
Pel	Tower, boom hoist and motors			
Per	Stagings and runways			
Pess	Steam shovel			
Pe	Misc. other plant			
Pe-T	Team plant			

Forms

Fed	Footings (M. E. & S.)	22 sqs.	12.00	264
Fadw	Foundation walls M.	80 sqs.	3.50	280
Fedw	and pilasters E.	180 sqs.	13.00	2,340
Fidw	and pilasters S.	180 sqs.	3.50	630
Feh	Frames at basement windows	No. 52	3.50	182
Facx	Interior and exterior M.	46 sqs.	5.30	244
Fecx	columns E.	93 sqs.	18.00	1,675
Ficx	S.	93 sqs.	2.50	233
Feci	Interior round columns	No. 6	6.00	36
Fafb	Beams and girders M.	200 sqs.	3.50	700
Fefb	slab E.	348 sqs.	12.00	4,180
Fifb	S.	348 sqs.	1.50	522
Fep	Concrete platform MES.	2½ sqs.	18.00	45
Fes	Stairs and landings and steps	68 l. f.	.50	34
Ful	Unload and handle lumber	100 M	2.00	200

Steel Reinforcement

Ref	Cut, bend and place all slab and beam steel	62 tons	25.00	1,550
Rec	Cut, bend and place all column steel	10 tons	26.00	260
Rez	Cut, bend and place all foundation wall, footing and misc. steel	22 tons	35.00	770
Ru	Steel reinforcement unloading and sorting	94 tons	2.00	188
Ru-T	Team all steel reinforcement	94 tons	....	75

Concrete

Med	Footings	78 c. y.	1.80	141
Medw	Foundation walls, pilasters and areaways	244 c. y.	2.25	548
Mep	Paving	84 c. y.	1.80	151
Mez	Platform	5 c. y.	2.50	13
Mes	Steps, landings	68 l. f.	.30	20
Mef	Slabs, beams, girders and columns	700 c. y.	2.00	1,400
Kuaf	Granolithic finish (laid after)	258 sqs.	8.00	2,070
Kub	Sanitary base in toilet rooms	482 l. f.	30	145
Kof	Float finish	12 sqs.	3.00	36
Kiw 1	Patch and rub exterior concrete	19 sqs.	....	300
Kiw 2	Sundry carbo. rub in parts of basement left unplastered	.....	....	300
Mo	Cut fins and fill voids on concrete ceilings painted	.....	....	400
Mux	Unload and handle cement	2,450 bbls.	.14	343
Mux-T	Team cement	2,450 bbls.	.14	343
Muyz	Trim sand and gravel pile	2,570 tons	.06	155
Mecc	Cinder concrete fill	18 c. y.	5.00	90
Mu	Unload peastone and team to job	98 tons	.75	74

Masonry

Bew	Stage, tend and lay all brickwork	8,090 c. f.	.90	7,280
Bet	Terra cotta tile partitions, 4″ and 6″	17,895 s. f.	. 12	2,150
Bewc	Clean down brick and stone	130 sqs.	4.00	520
Bec	Set all granite (imitation)	3,135 c. f.	1.00	3,135
Bef	Flue, etc., including fire brick and panels at front entrance of brick	....	....	400
Bu-T	Team brick, tile, lime and stone	....	....	400
Bu	Unload and handle all brick, tile, lime and imitation granite	....	....	450
Beg	Set granite at front entrance and other door sills	300 c. f.	....	300

Steel and Iron

Sedf	Set door frames Single	No. 83	5.00	415
	Double (Hollow metal)	No. 5	7.00	35
Sedfm	Set steel channel frames	No. 2	5.00	10
Sed	Set metal covered and steel doors	No. 2	....	50
Sel	Set steel lintels and column cores	....	....	300
Sez	Miscellaneous iron and steel, including steel sash	40 sqs.	....	300
Su	Handle all miscellaneous iron	40 sqs.		

Carpentry

Cedf	Set wood door frames	No. 8	7.00	56
Ced	Set all wood doors, Front Entrance	No. 1	....	1,140
	Double	No. 12	20.00	1,140
	Single	No. 85	10.00	1,140
	W. C. doors	No. 20	2.00	1,140
Cewf	Set window frames	No. 215	4.00	860
Cet	All interior trim and exterior millwork	....	....	2,000
Ces	Set wood sash and glass	4,437 s. f.	....	2,000
Cet	Maple top floor	20 sqs.	8.00	160
Cesc	2x4 screeds, treated, set in concrete	1,500 l. f.	....	160
Cesf	⅞″ sub-floor and paper	2½ M		
Cez	Miscellaneous carpentry work including louvers and ceiling over portico	....	....	200

Other Trades

		Quantity	@	Total
Gewp	Waterproof labor on foundation walls and other exterior walls	....	....	$150
Sch	Scheduling and job expediting	....	....	200
Zor	Clean up job, team away rubbish and clean glass at completion	....	....	500
Zarp	Engineering on lot and building lines	....	....	150
Zsc	Attendance on sub-contractors	....	....	400
M	Cold weather expense	....	....	2,500
W	Watchman	....	....	750
O	Overhead	....	....	4,200

TOTAL LABOR AND TEAMS................$56,748

MATERIALS AND SUB-CONTRACTS

Plant

Small tools (less salvage)	$5,000
Supplies (used up no salvage)	
Power, fuel, water, light and temporary connections	
Teaming and freight charge on small tools, supplies and large plant	
Rental and repairs of large plant	
1. Excavation	
2. Concrete	
3. Forms and carpentry	
4. Masonry	
5. Reinforcement	
6. Miscellaneous	

Carpentry Materials

Form lumber 100 M at 40.00	4,000		
Salvage	300	....	3,700
Nails, oils, bolts and hangers for form lumber and sheeting	....	....	600
Sheeting lumber	3 M	$40.00	120
Screeds	1,600 l. f.	....	175
⅞″ sub-floor	3 M	40.00	120
Top floor	3 M	100.00	300
All interior trim and millwork	....	....	3,000
Wood sash and glass and frames	4,337 s. f.	.85	3,680
Wood doors (Single)	No. 85	....	1,100
Wood doors (Double)	No. 12		
Wood door frames	No. 8	....	50

Steel and Iron

Metal column forms	No. 6	....	225
Steel reinforcement	94 tons	56.00	5,270
Wire sundries for reinforcement	....	....	300
Structural steel lintels	905 l. f.	....	500
Door frames (metal) (Single)	No. 83	....	1,050
Door frames (metal) (Double)	No. 7		
Miscellaneous iron and steel	....	....	500
Hardware for entire job	....	....	1,800
Column cores and base plates and caps	No. 6	....	450
Metal doors tin clad and steel	No. 2	....	100

Concrete and Masonry Materials

Cement 2,450 bbls. at 3.05	7,480	....	....
Credit on bags returned 2,450 bbls. .40	980	....	6,500
Cement tests	2,450 bbls.	.03	74
Loss on empties	2,450 bbls.	.05	123
Sand	1,050 tons	1.25	1,315
Gravel	1,420 tons	2.25	3,190
Peastone	98 tons	6.00	588
Lime for mortar	25 tons	20.00	500
Common brick	154 M	17.50	2,700
Fire brick and flue lining	....	....	250
Imitation granite	3,135 c. f.	....	10,000
Terra cotta tile 4″	17,895 s. f.	.09	1,610
Granite steps and thresholds	....	....	1,600

General and Miscellaneous Materials

Test boring	....	....	535
Brick anchors and ties	....	....	200
Building paper for floors and miscellaneous	....	....	300
Waterproofing	....	....	320

Sub-Contracts

1. (a) Roofing, flashing, conductor heads	1,400	....	2,500
(b) Cork insulation	1,100		
2. W. C. partitions, marble and doors	No. 19	....	1,700
3. Ceramic floors in toilets and bases	....	....	1,200
4. Linoleum 3/16″ in special offices	....	....	400
5. Metal lath and plaster for entire job, including hung ceilings and cement base (approximately 7,800 s. y.)	....	....	9,200
6. Painting for entire job	....	....	5.200
7. Weather strips for sash	....	....	700
8. City connections to sewers, for gas, water, etc	......	....	250
9. Ash hoist in place	....	....	250
10. Iron stairs and W. I. rail and ornamental iron	....	....	3,000
11. Bluestone treads for stairs	....	....	500
12. Elevator doors and frame	No. 4	....	700
13. Travertine floor and base at main entrance	63 l. f.	....	400
Cold weather expense	....	....	3,000
Expediting expenses	....	....	350
Liability insurance (fire insurance by owner)	....	....	2,000
Superintendence, travel, office, stationery, telephone	....	....	6.000

TOTAL MATERIALS AND SUB-CONTRACTS........$95,195

(JOB BUDGET, CONTINUED)

Equipment	Quantity	Total
1. Heating, boilers and stack	15,000	
2. Plumbing, conductors, drains and sewers	7,500	
3. Gas piping	350	
4. Elevator (freight of 2 tons, slow speed)	2,300	
5. Electric work and wiring (no fixtures included) elevator wiring	4,500	$29,650
LABOR		56,748
TOTAL LABOR, MATERIALS AND SUB-CONTRACTS AND EQUIPMENT		$179,593

Items not included:

1. Roads, sidewalks, general planting, auto space, landscape work.
2. Removing old buildings.
3. Wood top floors except in Assembly Hall.
4. Color for granolithic floors.
5. Screens for windows and doors.
6. Rock, ledge or quicksand or running water in excavation.
7. Lighting fixtures, telephones, furniture or rugs.
8. Window shades.
9. Fireplaces.

Timekeeping. The timekeeping code in use by this Company is based on the "mnemonic" system. The first letter of the code item is a consonant indicating the general classification; D for excavation or digging, P for plant, F for forms, B for brickwork, etc. The second letter is a vowel indicating the kind of labor; that is, a for making, e for placing, i for removing, etc. The third letter or combinations of third and fourth letters are consonants indicating the part of the building to which the item applies. These last letters have different meanings in some different classifications, but as far as possible are confined to one kind of work; that is, d would apply to footings whether in connection with excavation, forms, concrete or reinforcement; c would apply to columns in every case; and f would always mean floors, etc.

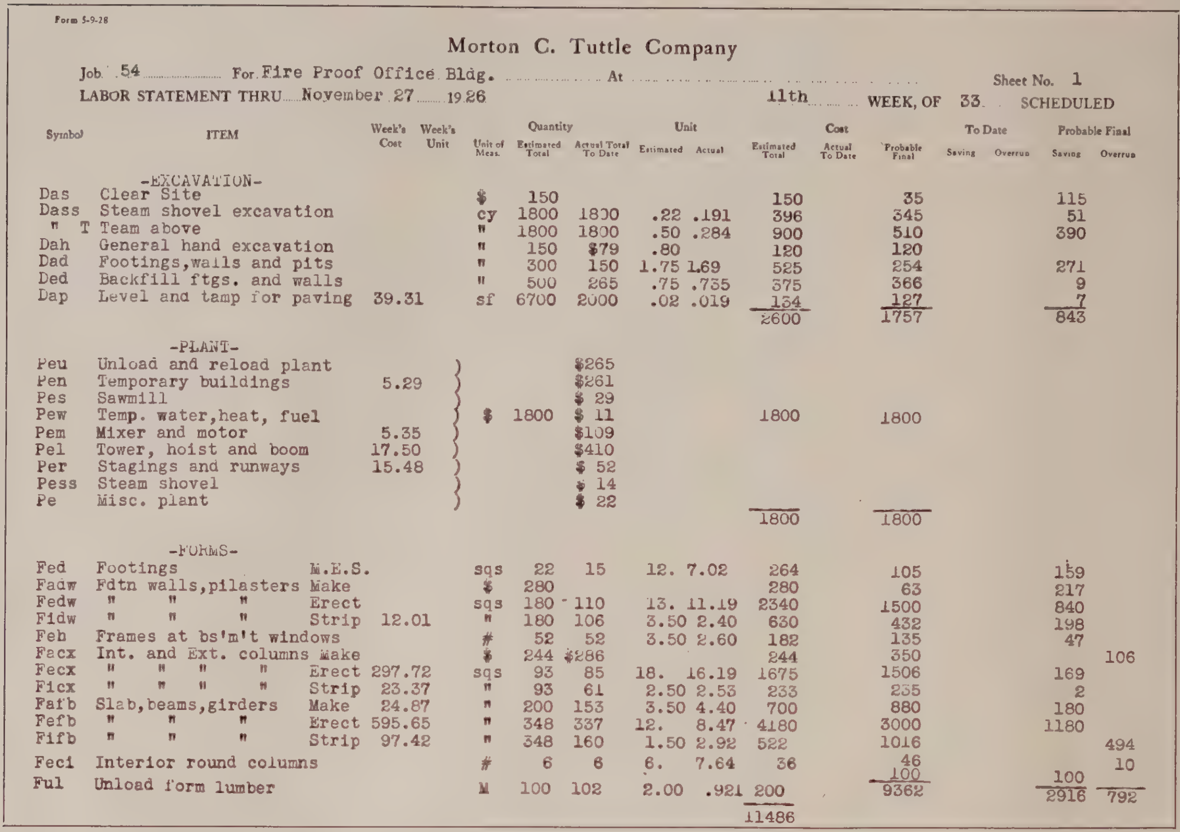
This code is used primarily for recording at definite times through each day the exact work on which each man on the job is engaged. The time sheet on which this record is made is divided into columns, each representing one hour of the day, while a vertical column at the left shows the number by which each individual on the job is known. In recording the time the timekeeper simply notes opposite a man's number and in the proper hourly column the code classification of the work on which the man is engaged. This time sheet is summarized each day by collecting all of the charges under each code classification. Incidentally, the total number of hours of each man's labor is transferred to the payroll sheet.

Although the various labor charges are summarized in finished form only once each week, it will be obvious that it is a simple matter to check up, whenever desired, what a single day's costs are on a given item. For instance, it is frequently desired to know what the day's cost is on concrete or brickwork, the quantity measurement of which is a simple matter. Accordingly, an hour's work on the time sheet will summarize the particular item so that the actual cost of a day's work is easily shown the early part of the following day, and opportunity is given to correct any irregularity that may be shown by the figures.

Labor Statement. Daily labor costs are transferred to a summary sheet which is completed once each week and transferred to a form called the labor statement. This form follows exactly the items as laid out in the labor budget. The labor statement reproduced herewith is taken at the end of the eleventh week of the work. It will be noted that it shows the week's cost, that it compares the actual cost with estimated cost in both total expense and units and, what is of the greatest importance, it indicates what the final cost of each item will be if completed at the going rate of accomplishment. Too much emphasis cannot be placed on the value of this particular point. It will be obvious that a cost system which shows costs only at the completion of a contract is of value only to the contractor in estimating future work and is of no use whatever during construction as offering an opportunity to correct unsatisfactory conditions. It will also be obvious that if, in the labor statement shown, the expenditure on each item were given without reference to the uncompleted remainder, it might well indicate a false condition. For instance, certain items involving a limited amount of work might show a saving totaling some hundreds of dollars, whereas one of the larger items, of which only a small part of the total had been completed, might show an over-run in actual expenditure far less than the total of savings on other items. Therefore, considered as an independent statement, the weekly report would show the job to have saved money, yet on the large item which is over-running (if the rate of over-run were to continue through the life of the job), the final extra expense might far more than offset any savings on smaller items.

This labor statement is forwarded each week by the field superintendent to the Manager of Construction at the main office, who immediately interests himself in any items which may be out of proportion, and in consultation with the field superintendent he gives particular attention to the items in question with a view to correcting them *while the work is still under way.*

Material Statement. A material statement similar in form to the labor statement is also based on the job budget. Because this material statement is largely a record of purchases and does not offer the opportunity for correcting conditions as does the labor portion of the work, it is compiled only once each month. It does, however, carry out the same idea as the labor statement in showing in its final columns the probable standing of the cost of material *at the end of the work.* It will be noted that actual quantities vary in many cases from estimated quantities, and that there is also frequent variation between both esti-

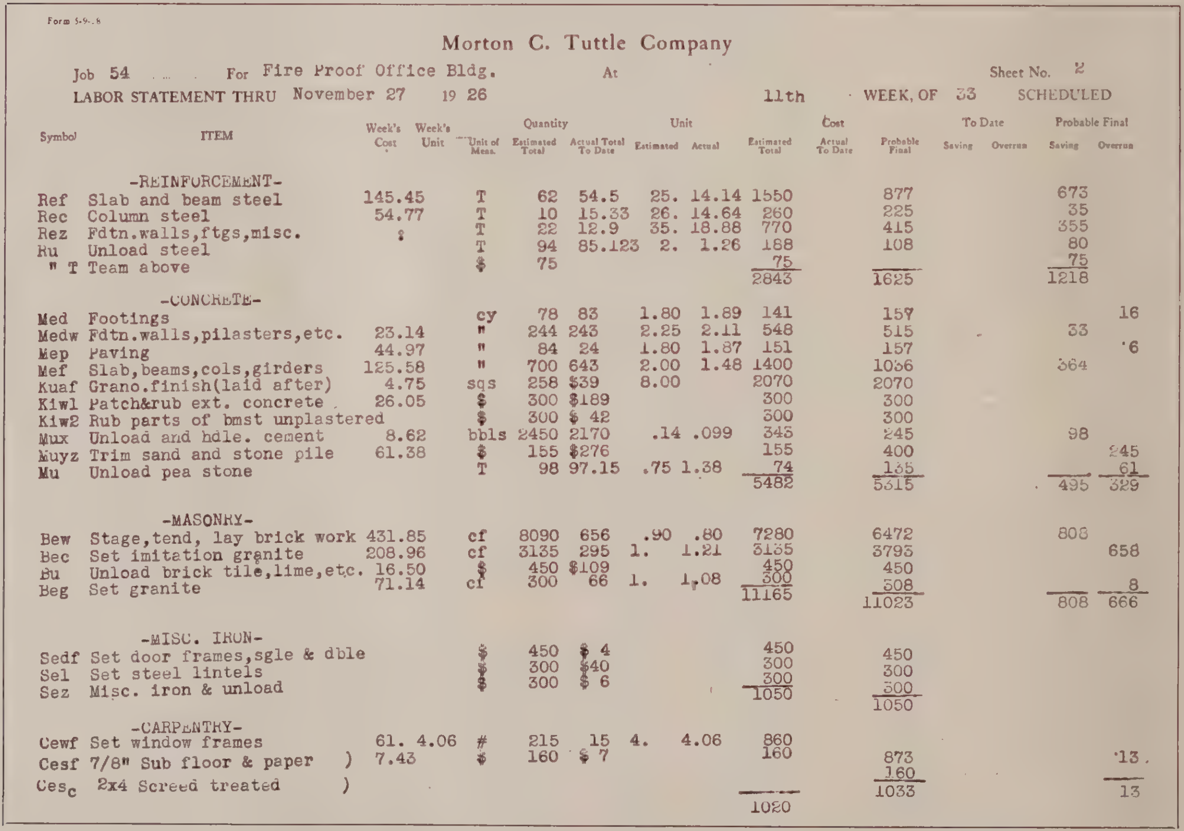


Form 5-9-28

Morton C. Tuttle Company

Job 54 For Fire Proof Office Bldg. At Sheet No. 1
LABOR STATEMENT THRU November 27 1926 11th WEEK, OF 33 SCHEDULED

Symbol	ITEM	Week's Cost	Week's Unit	Quantity			Unit		Cost			To Date		Probable Final	
				Unit of Meas.	Estimated Total	Actual Total To Date	Estimated	Actual	Estimated Total	Actual To Date	Probable Final	Saving	Overrun	Saving	Overrun
	-EXCAVATION-														
Das	Clear Site			$	150				150		35			115	
Dass	Steam shovel excavation			cy	1800	1800	.22	.191	396		345			51	
" T	Team above			"	1800	1800	.50	.284	900		510			390	
Dah	General hand excavation			"	150	$79	.80		120		120				
Dad	Footings, walls and pits			"	300	150	1.75	1.69	525		254			271	
Ded	Backfill ftgs. and walls			"	500	265	.75	.735	375		366			9	
Dap	Level and tamp for paving	39.31		sf	6700	2000	.02	.019	134		127			7	
									2600		1757			843	
	-PLANT-														
Peu	Unload and reload plant		)			$265									
Pen	Temporary buildings	5.29	)			$261									
Pes	Sawmill		)			$ 29									
Pew	Temp. water, heat, fuel		)	$	1800	$ 11			1800		1800				
Pem	Mixer and motor	5.35	)			$109									
Pel	Tower, hoist and boom	17.50	)			$410									
Per	Stagings and runways	15.48	)			$ 52									
Pess	Steam shovel		)			$ 14									
Pe	Misc. plant		)			$ 22									
									1800		1800				
	-FORMS-														
Fed	Footings M.E.S.			sqs	22	15	12.	7.02	264		105			159	
Fadw	Fdtn walls, pilasters Make			$	280				280		63			217	
Fedw	" " " Erect			sqs	180	110	13.	11.19	2340		1500			840	
Fidw	" " " Strip	12.01		"	180	106	3.50	2.40	630		432			198	
Feb	Frames at bs'm't windows			#	52	52	3.50	2.60	182		135			47	
Facx	Int. and Ext. columns Make			$	244	$286			244		350				106
Fecx	" " " " Erect	297.72		sqs	93	85	18.	16.19	1675		1506			169	
Ficx	" " " " Strip	23.37		"	93	61	2.50	2.53	233		235			2	
Fafb	Slab, beams, girders Make	24.87		"	200	153	3.50	4.40	700		880			180	
Fefb	" " " Erect	595.65		"	348	337	12.	8.47	4180		3000			1180	
Fifb	" " " Strip	97.42		"	348	160	1.50	2.92	522		1016				494
Feci	Interior round columns			#	6	6	6.	7.64	36		46				10
Ful	Unload form lumber			M	100	102	2.00	.921	200		100			100	
									11486		9362			2916	792



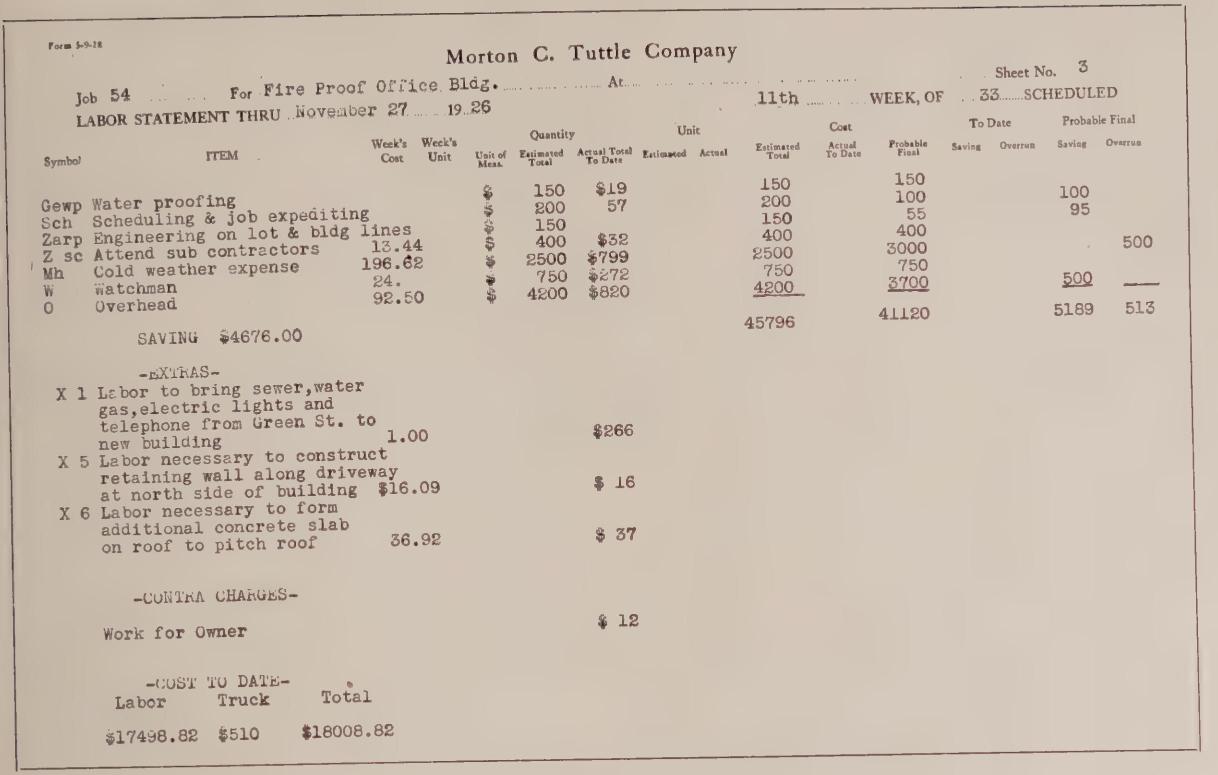
Form 5-9-28

Morton C. Tuttle Company

Job 54 For Fire Proof Office Bldg. At Sheet No. 2
LABOR STATEMENT THRU November 27 19 26 11th WEEK, OF 33 SCHEDULED

Symbol	ITEM	Week's Cost	Week's Unit	Quantity			Unit		Cost			To Date		Probable Final	
				Unit of Meas.	Estimated Total	Actual Total To Date	Estimated	Actual	Estimated Total	Actual To Date	Probable Final	Saving	Overrun	Saving	Overrun
	-REINFORCEMENT-														
Ref	Slab and beam steel	145.45		T	62	54.5	25.	14.14	1550		877			673	
Rec	Column steel	54.77		T	10	15.33	26.	14.64	260		225			35	
Rez	Fdtn. walls, ftgs, misc.			T	22	12.9	35.	18.88	770		415			355	
Ru	Unload steel			T	94	85.123	2.	1.26	188		108			80	
" T	Team above			$	75				75					75	
									2843		1625			1218	
	-CONCRETE-														
Med	Footings			cy	78	83	1.80	1.89	141		157				16
Medw	Fdtn. walls, pilasters, etc.	23.14		"	244	243	2.25	2.11	548		515			33	
Mep	Paving	44.97		"	84	24	1.80	1.87	151		157				6
Mef	Slab, beams, cols, girders	125.58		"	700	643	2.00	1.48	1400		1036			364	
Kuaf	Grano. finish (laid after)	4.75		sqs	258	$39	8.00		2070		2070				
Kiw1	Patch&rub ext. concrete	26.05		$	300	$189			300		300				
Kiw2	Rub parts of bmst unplastered			$	300	$ 42			300		300				
Mux	Unload and hdle. cement	8.62		bbls	2450	2170	.14	.099	343		245			98	
Muyz	Trim sand and stone pile	61.38		$	155	$276			155		400				245
Mu	Unload pea stone			T	98	97.15	.75	1.38	74		135				61
									5482		5315			495	329
	-MASONRY-														
Bew	Stage, tend, lay brick work	431.85		cf	8090	656	.90	.80	7280		6472			808	
Bec	Set imitation granite	208.96		cf	3135	295	1.	1.21	3135		3793				658
Bu	Unload brick tile, lime, etc.	16.50		$	450	$109			450		450				
Beg	Set granite	71.14		cf	300	66	1.	1.08	300		508				8
									11165		11023			808	666
	-MISC. IRON-														
Sedf	Set door frames, sgle & dble			$	450	$ 4			450		450				
Sel	Set steel lintels			$	300	$40			300		300				
Sez	Misc. iron & unload			$	300	$ 6			300		300				
									1050		1050				
	-CARPENTRY-														
Cewf	Set window frames	61.	4.06	#	215	15	4.	4.06	860						
Cesf	7/8" Sub floor & paper)	7.43		$	160	$ 7			160		873				13
Ces_c	2x4 Screed treated)										160				
									1020		1033				13

Facsimiles of Labor Statement Sheets, Omitting the Ruling, in Light Blue and Red, of the Originals



Form 5-9-28

Morton C. Tuttle Company

Job 54 For Fire Proof Office Bldg. At

Sheet No. 3

LABOR STATEMENT THRU November 27 1926

11th WEEK, OF 33 SCHEDULED

Symbol	ITEM	Week's Cost	Week's Unit	Unit of Meas.	Quantity Estimated Total	Quantity Actual Total To Date	Unit Estimated	Unit Actual	Cost Estimated Total	Cost Actual To Date	Cost Probable Final	To Date Saving	To Date Overrun	Probable Final Saving	Probable Final Overrun
Gewp	Water proofing			$	150	$19			150		150				
Sch	Scheduling & job expediting			$	200	57			200		100			100	
Zarp	Engineering on lot & bldg lines			$	150				150		55			95	
Z sc	Attend sub contractors	13.44		$	400	$32			400		400				
Mh	Cold weather expense	196.62		$	2500	$799			2500		3000				500
W	Watchman	24.		$	750	$272			750		750				
O	Overhead	92.50		$	4200	$820			4200		3700			500	——
									45796		41120			5189	513

SAVING $4676.00

-EXTRAS-

X 1	Labor to bring sewer, water gas, electric lights and telephone from Green St. to new building	1.00	$266
X 5	Labor necessary to construct retaining wall along driveway at north side of building	$16.09	$ 16
X 6	Labor necessary to form additional concrete slab on roof to pitch roof	36.92	$ 37

-CONTRA CHARGES-

Work for Owner $ 12

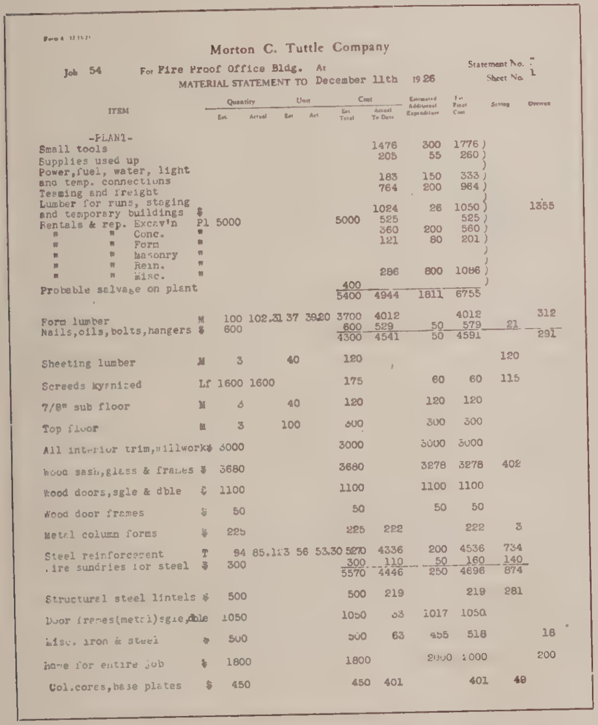
-COST TO DATE-

Labor	Truck	Total
$17498.82	$510	$18008.82

Labor Statement, Continued

mated and actual unit costs and between estimated and actual total costs. The last columns, however, show that various savings more than offset over-runs, and that on the material side of the work there is at this point a substantial margin.

Cost Tendency Chart. In order to more quickly and clearly indicate the condition of the work as regards labor costs, it is a practice in this Company to plot each weekly labor statement on a cost tendency or "lightning" chart. This



Form 6 12-15-25

Morton C. Tuttle Company

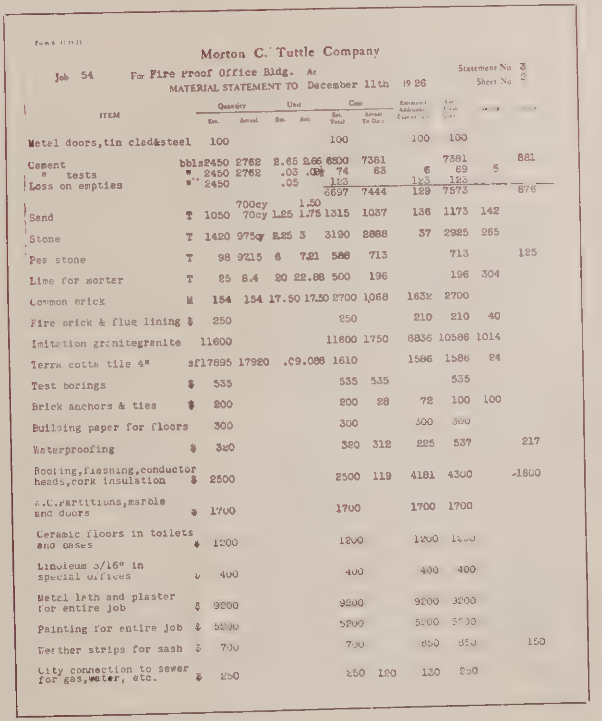
Job 54 For Fire Proof Office Bldg. At

Statement No.

Sheet No. 1

MATERIAL STATEMENT TO December 11th 1926

ITEM		Quantity Est.	Quantity Actual	Unit Est.	Unit Act.	Cost Est. Total	Cost Actual To Date	Estimated Additional Expenditure	For Final Cost	Saving	Overrun
-PLANT-											
Small tools							1476	300	1776		
Supplies used up							205	55	260		
Power, fuel, water, light and temp. connections							183	150	333		
Teaming and freight							764	200	964		
Lumber for runs, staging and temporary buildings	$						1024	26	1050		1355
Rentals & rep. Excav'n	Pl	5000				5000	525		525		
" " Conc.	"						360	200	560		
" " Form	"						121	80	201		
" " Masonry	"										
" " Rein.	"										
" " Misc.	"						286	800	1086		
Probable salvage on plant						400					
						5400	4944	1811	6755		
Form lumber	M	100	102.31	37	39.20	3700	4012		4012		312
Nails, oils, bolts, hangers	$	600				600	529	50	579	21	
						4300	4541	50	4591		291
Sheeting lumber	M	3		40		120				120	
Screeds kyanized	Lf	1600	1600			175		60	60	115	
7/8" sub floor	M	3		40		120		120	120		
Top floor	M	3		100		300		300	300		
All interior trim, millwork	$	3000				3000		3000	3000		
Wood sash, glass & frames	$	3680				3680		3278	3278	402	
Wood doors, sgle & dble	$	1100				1100		1100	1100		
Wood door frames	$	50				50		50	50		
Metal column forms	$	225				225	222		222	3	
Steel reinforcement	T	94	85.123	56	53.30	5270	4336	200	4536	734	
Wire sundries for steel	$	300				300	110	50	160	140	
						5570	4446	250	4696	874	
Structural steel lintels	$	500				500	219		219	281	
Door frames (metal) sgle, dble		1050				1050	33	1017	1050		
Misc. iron & steel	$	500				500	63	455	518		18
Hdwe for entire job	$	1800				1800		2000	2000		200
Col. cores, base plates	$	450				450	401		401	49	



Form 6 12-15-25

Morton C. Tuttle Company

Job 54 For Fire Proof Office Bldg. At

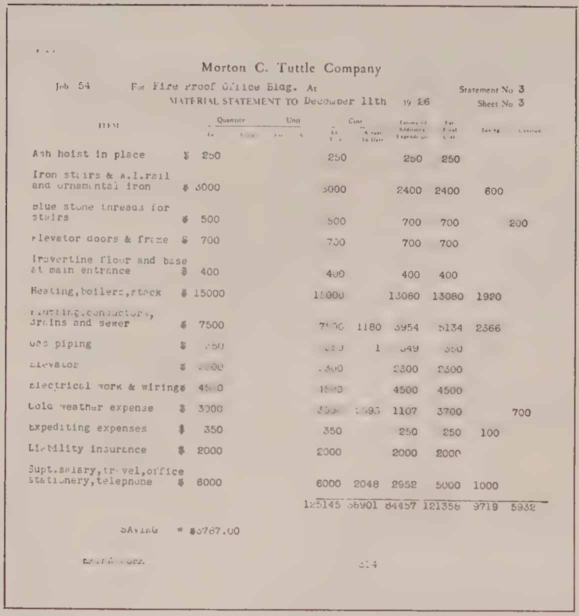
Statement No 3

Sheet No 2

MATERIAL STATEMENT TO December 11th 1926

ITEM		Quantity Est.	Quantity Actual	Unit Est.	Unit Act.	Cost Est. Total	Cost Actual To Date	Estimated Additional Expenditure	For Final Cost		
Metal doors, tin clad&steel		100				100		100	100		
Cement	bbls	2450	2762	2.65	2.66	6500	7381		7381		881
" tests	"	2450	2762	.03	.02½	74	63	6	69	5	
Loss on empties	"	2450		.05		123		123	123		
						6697	7444	129	7573		876
Sand	T	1050	700cy 70cy	1.25	1.50 1.75	1315	1037	136	1173	142	
Stone	T	1420	975cy	2.25	3	3190	2888	37	2925	265	
Pea stone	T	98	9715	6	7.21	588	713		713		125
Lime for mortar	T	25	8.4	20	22.88	500	196		196	304	
Common brick	M	154	154	17.50	17.50	2700	1068	1632	2700		
Fire brick & flue lining	$	250				250		210	210	40	
Imitation granitegranite		11600				11600	1750	8836	10586	1014	
Terra cotta tile 4"	sf	17895	17920	.09	.088	1610		1586	1586	24	
Test borings	$	535				535	535		535		
Brick anchors & ties	$	200				200	28	72	100	100	
Building paper for floors		300				300		300	300		
Waterproofing	$	320				320	312	225	537		217
Roofing, flashing, conductor heads, cork insulation	$	2500				2500	119	4181	4300		1800
A.C. Partitions, marble and doors	$	1700				1700		1700	1700		
Ceramic floors in toilets and bases	$	1200				1200		1200	1200		
Linoleum 3/16" in special offices	$	400				400		400	400		
Metal lath and plaster for entire job	$	9200				9200		9200	9200		
Painting for entire job	$	5200				5200		5200	5200		
Weather strips for sash	$	700				700		850	850		150
City connection to sewer for gas, water, etc.	$	250				250	120	130	250		

Material Statements for a Fireproof Office Building



Morton C. Tuttle Company

Job 54 For Fire Proof Office Bldg. At Statement No 3

MATERIAL STATEMENT TO December 11th 19 26 Sheet No 3

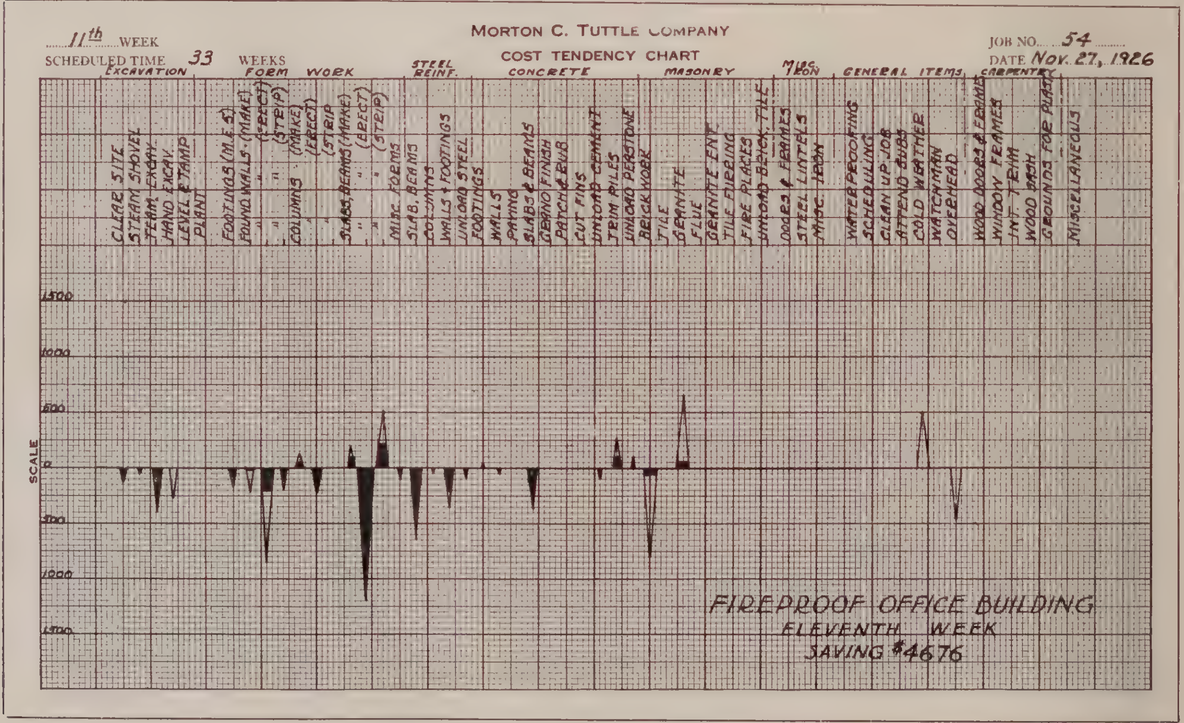
ITEM	Quantity	Cost	Actual To Date	Estimated Additional Expenditure	Est. Final Cost	Saving	Overrun
Ash hoist in place	$ 250	250		250	250		
Iron stairs & W.I.rail and ornamental iron	$ 3000	3000		2400	2400	600	
Blue stone treads for stairs	$ 500	500		700	700		200
Elevator doors & frame	$ 700	700		700	700		
Travertine floor and base at main entrance	$ 400	400		400	400		
Heating, boilers, stack	$ 15000	15000		13080	13080	1920	
Plumbing, conductors, drains and sewer	$ 7500	7500	1180	3954	5134	2366	
Gas piping	$ [illegible]50	[illegible]	1	549	550		
Elevator	$ [illegible]00	[illegible]300		2300	2300		
Electrical work & wiring	$ 45[illegible]0	[illegible]		4500	4500		
Cold weather expense	$ 3000	[illegible]	[illegible]593	1107	3700		700
Expediting expenses	$ 350	350		250	250	100	
Liability insurance	$ 2000	2000		2000	2000		
Supt. salary, travel, office stationery, telephone	$ 6000	6000	2048	2952	5000	1000	
		125145	56901	84457	121358	9719	5932

SAVING = $3787.00

chart, covering the work at the end of the eleventh week is reproduced herewith and will be generally self-explanatory. By reference to the chart it is immediately apparent just which items are showing greatest deviation from the budget.

Like the labor and material statements, the principal emphasis in this chart is on the *probable final cost of the work* rather than the total expenditure to date. Therefore the high points of the variations are the points which would show *at the end of the work* if the going rate of accomplishment were continued. The amount of saving is the indicated saving *at the end of the work* rather than at the time the chart is plotted. Copies of this cost tendency chart are sent each week to the architect and to the owner, thus keeping them informed in detail as the work proceeds.

Extra Work. The method of caring for additions and changes under the service type of contract as compared with the usual agreement made on the basis of competitive bids is interesting. In the latter case the contractor generally names a lump sum for each item, and there is usually little opportunity for architect or owner to question the amount. Under a service type of contract, however, the architect or owner is given an estimate in detail showing exactly what each addition or change involves. When an extra item is authorized it is simply carried along and accounted for in the same way as the rest of the work under a number assigned to it. In this way the owner pays the exact cost of labor and material plus the contractor's fee, which is usually a pre-determined percentage of cost. A periodic statement of all extras is compiled and given to architect and owner in order that these costs may be added to the weekly labor and material statements to show the total probable final cost. It is, therefore, obvious that on the service basis there is no opportunity for making arbitrary demands in connection with extra work, and that one major source of discord is in this way eliminated.



The Cost Tendency Chart is an Important Factor in Cost Control

THE SUPERVISION OF CONSTRUCTION OPERATIONS

BY

WILFRED W. BEACH

CHAPTER 8. FORM WORK

SPECIFICATIONS for form work for the school building under discussion read:

FORMS:—

"(A) IN GENERAL. The Contractor shall provide all required wood (or other) forms for the proper execution of all concrete work, plain and reinforced, and supplied in sufficient quantity so that the work can be prosecuted with despatch. Removable steel forms of No. 16 gauge metal, of approved design, may be used where appropriate for floor slabs, at option of Contractor.

"(B) STRENGTH of all forms shall be sufficient to carry the dead load of materials and construction operations without deflection or vibration. They shall be so braced as to be rigid under trucking and other action incidental to building. They shall be so designed as to be capable of needed adjustments, shall be carefully watched as work proceeds, and all faults promptly corrected.

"(C) SMOOTHNESS. Surfaces of forms in contact with concrete, intended to remain exposed, shall be of dressed lumber with tight joints, so built as to provide, after removal, a true, smooth finished concrete. Members and surfaces shall be straight and true to line; walls, columns and piers absolutely perpendicular, and all horizontal members free from the slightest sag. Perfect finish will not be required on those surfaces exposed in unfinished rooms, in basement, or in ducts, or those elsewhere which are to be concealed by subsequent construction. All surfaces shall, however, be true to planes and profiles detailed.

"(D) INSPECTION. Ample opportunity shall be given the Superintendent to examine all forms just before concrete is poured. They shall then be thoroughly clean, free from shavings, tags, dirt or other rubbish, and shall be thoroughly drenched, except in freezing weather. Forms for vertical construction shall have openings at bottom, until ready for pouring, to permit removal of rubbish and dirt.

"(E) WRECKING OF FORMS shall not be started for 7 days after pouring, and none shall be done until the Superintendent gives consent and then only at the sole risk of the Contractor. After wrecking, sufficient struts shall remain to insure rigidity and strength until final set."

So far as the interest of the architect or engineer is concerned, forms (or centering) are in the same category as other equipment of the builder's,—merely tools of his trade intended to produce certain desired results at minimum expense. It is the contractor's business to determine—

(1) Of what material the forms shall be constructed.

(2) How they shall be put together.

(3) How they shall be braced and secured.

(4) That they are clean at time of pouring, and drenched, oiled or soaped as called for.

(5) What means are to be provided for easy wrecking, with least damage.

(6) That wrecking is not done too soon and that sufficient struts are left.

The superintendent must see—

(1) That the form material is such that it will produce true surfaces of the intended texture.

(2) That forms are built to the exact dimensions of the finished work.

(3) That all bracing is adequate.

(4) That all surfaces are in proper condition at the time of pouring.

(5) That wrecking of forms is done in such manner as not to injure the concrete.

(6) That wrecking is not done too soon, and that sufficient temporary supports are left.

Form lumber is often the first material delivered, and carpenters are at once set to work to prepare it to be placed. As to this material, the superintendent's main concern is that it is of a character to produce the desired finished surfaces. Second hand material should not be used for forms for finished surfaces, owing to its lack of uniformity. There is an increasing tendency among architects to build finished concrete surfaces on which all form marks are plainly visible, and the marks of the grain of rough lumber. This is frankly monolithic concrete, without any rubbing or coating whatever. Others require the surfaces to be rubbed, treated with grout or by means of a cement gun. For the former effect, one must see that no form member is of a character to mar the intended finish. But, if the surfaces are to be rubbed, coated, plastered or veneered, then a lesser degree of perfection of form surface is necessary. In any event, form lumber should be medium dry and free from loose or large knots. Kiln-dried lumber is too absorbent, and green lumber is too likely to shrink and cause leaks and ridges.

The builder may construct his basement wall forms of separate boards or planks or of sections previously built up and intended to be interchangeable. Such sections are sometimes taken from job to job and can be used six or eight times, whereas separate boards can seldom be used more than two or three times,—frequently only once.

By referring to Fig. 8, it is to be noted that, in this work, forms were required for the upper portions of footings, the lower portions of which were deposited within earth banks; 2 x 6-inch members were used for these footing forms, which were held in place by driven stakes and, later, easily removed. After the footings were partially set and the waterproof course in place, work on wall forms proceeded at once, progressing in both directions from the southeast corner.

The superintendent carefully verified all dimensions and saw that the form work was rigidly braced, especially at the bottom, where the weight of the fluid mass exerts greatest pressure. Weak forms are said to "constitute one of the four principal causes to which have been attributed the failures in some concrete buildings. These causes are (1) imperfect design, (2) poor materials, (3) faulty construction and (4) weak forms."* Especially must the superintendent see that forms made of ⅞-inch boards are erected with more frequent ribbing than if 1¾-inch plank is employed. For the former, the ribs or studs cannot exceed 2 feet on centers with safety, while those for plank can be double the distance, except that, where the depth of forms exceeds 12 feet, it may be found necessary to decrease the spacing in either instance, in order to prevent "bulging" and the consequent "wavy" surface in the concrete.

The experienced superintendent will be in no way officious in his inspection and criticism of form work. He is particular to impress upon the foreman the latter's full responsibility for everything pertaining to the forms. The superintendent's coöperation in this regard is advisory only, and hence he must avoid assuming any liability,—as is ever the case where he is privileged and expected to call attention to defects in working methods and implements, but he should give approval to naught but satisfactory results. This point in the performance of a superintendent or inspector cannot be too thoroughly stressed. His assumption of undue authority may at times involve him in serious trouble, as has already been explained in these articles.

Where basement wall forms extend to the under side of the first floor slab, as is frequently the case, due regard must be had for window and door openings and for pockets for beam and girder bearings, flue openings and the like. Builders of forms are accustomed to look upon it as the roughest of work, and hence often need the closest watching in the matter of dimensions and the insertion of minor built-in mouldings and other members. The foreman should be impressed with the importance of these and be compelled to work to a fraction of an inch in order that all carelessness may be eliminated at the start instead of being permitted to become a habit. He can easily be made to see how much more simple it is to correct form work than to chop out concrete. This is especially true of surfaces that are to be paneled or otherwise enriched. Members must not only conform exactly to detail but must be so secured as not to be sprung out of place by rodding. The continuity of such members forming belt courses, rustication, etc., is of the utmost importance to a design, and hence they must be aligned and secured with the greatest accuracy and rigidity.

The superintendent on our school building also impressed upon the foreman the need of his being advised well in advance of the starting of pouring at any point. It is most convenient for a foreman to assume that the inspector is as fully informed as himself regarding all job conditions; but there are dozens of things about the premises demanding attention, any of which a conscientious inspector might be watching just when pouring is about to begin somewhere else. He must be advised in time to see that forms are in final condition, as set forth in the specifications under the head of "Inspection." Such inspection should not be made a half day, nor even an hour ahead of the pouring, but immediately before the first deposit is made. A superintendent must bear in mind that everything within the forms is in "temporary suspension" until embedded, easily jarred or kicked out of place, and that "foreign substance" is possessed of peculiar attraction for place in forms; that even the forms themselves are temporary in character and are the recipients of no respect from workmen. Again is "eternal vigilance the price of safety." It is one of the many times when a superintendent feels that he cannot turn his back for a moment but must apply the closest scrutiny to everything that is to be covered. The only foreign substances allowed to remain in the forms are the ties and spreaders. The former will be built in and cut off later, but the wooden spreaders must be fished out as the rodding proceeds. Workmen are sometimes careless about removing all of these, and they must be cautioned. It is serious work to cut them out of finished concrete.

Inspection of floor forms is no different from that of wall forms, except that special attention is to be paid to measurements of beam and girder work, making sure of proper thicknesses and alignment, and overseeing the method of installing supports. If any one of the several proprietary systems of concrete floor construction is used, the superintendent should be supplied with detailed drawings and specifications in order to make sure that the workmen know what they are doing and are performing the work correctly.

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* Page 611 in F. E. Kidder's "Building Construction and Superintendence."

Notwithstanding that the specifications place upon the contractor the entire responsibility for premature removal of forms, it is well for the architect and superintendent to have a working knowledge of what is considered good practice in this regard. Here is an excerpt from a consensus of opinion of several contractors whose expressions on the subject were combined and published by the Atlas Portland Cement Co.: "As a guide to practice these rules are suggested: Walls in mass work: one to three days, or until the concrete will bear the pressure of the thumb without indentation. Thin walls: in summer, two days; in cold weather, five days. Slabs up to 6 feet span: in summer, six days; in cold weather, two weeks. Beams and girders and long span slabs: in summer, ten days or two weeks; in cold weather, from three weeks to one month. If shores are left without disturbing them, the time of removal of the sheeting in summer may be reduced to one week. Column forms: in summer, two days; in cold weather, four days, provided girders are shored to prevent appreciable weight weakening columns. Conduits: two or three days, provided there is not a heavy fill upon them. Arches: of small size, one week; for large arches with heavy dead load, one month. A very important exception to these rules applies to concrete which has been frozen after placing, or has been maintained at a temperature just above freezing. In such cases the forms must be left in place until after warm weather comes, and then until the concrete has thoroughly dried out and hardened."

From this it will be seen that the question of the length of time that must elapse after pouring before forms can be removed depends much upon the service they are performing, and it is likewise a matter of judgment of the experienced concrete worker, it being borne in mind always that in the desire of a contractor to hasten the work and at the same time economize on form lumber, there is a constant temptation to wreck the forms a day or so too soon. Many floor failures have resulted from shortsightedness, and hence a superintendent should see that the contractor "plays safe."

THE SUPERVISION OF CONSTRUCTION OPERATIONS

CHAPTER 9

CONCRETE WORK

SPECIFICATIONS for cement and aggregates were quoted in a preceding chapter. As is customary, the superintendent in charge of construction of the schoolhouse being considered here gave early attention to the brand of cement to be used and to the character of aggregates delivered. Strictly speaking, the passing upon these materials is presumed to be based upon laboratory reports, and hence is not a function of the superintendent. However, inasmuch as the sand and crushed stone generally used are of kinds and grades easily judged by visual inspection, laboratory tests are frequently confined to the cement, even on work of importance. For the work under discussion, the contractor proposed using pit-run gravel for his plain concrete, adding the amount of sand or coarse aggregate that might be needed to make it conform to the specifications. For reinforced work, he was to screen out all stones larger than ¾-inch.

It is not expected that a superintendent will decide what kind of concrete will be used in any location. All questions of design are predetermined. He is at the site to see that they are properly carried out, to know that what is produced is fully up to specification requirements. To be able to assert that this has been accomplished, he must know:

(1) That the aggregates are
  (a) of proper kind,
  (b) sufficiently clean,
  (c) of correct size and shape,
  (d) well graded,
  (e) of adequate hardness,
  (f) of due moisture content;
(2) that the proportions are such as to produce the maximum density of each type called for;
(3) that the cement is fresh, up to test standards, and used in correct ratio;
(4) that all ingredients are properly mixed;
(5) that the completed mixture is
  (a) deposited promptly, without separation of ingredients,
  (b) adequately agitated,
  (c) undisturbed after setting begins,
  (d) properly bonded to previous work,
  (e) deposited only against surfaces in proper condition to receive it,
  (f) properly protected until final setting is complete.

Treating of these matters in the order enumerated, the superintendent gave his attention to the aggregates, while awaiting reports on the samples sent in for testing.

(1-a) *Kinds of Aggregates.* Our specification called for broken stone or gravel for the coarse aggregate, and sand for the fine, with a provision for the use of pit-run material. Crushed furnace slag is often specified in localities where it is procurable, and in some districts pulverized stone is used in place of sand. Crushed brick or tile may also be used for coarse aggregate, if of adequate hardness, of proper size, and free from dust. Cinders are used by many architects and engineers and are permitted in reinforced floor slab construction by certain building codes, notably that of New York. Other codes (as that of Chicago) permit the use of cinder concrete for fireproofing of steel members, but limit its workable compressive strength to 700 pounds per square inch. They also require that metal pipe embedded in cinder concrete shall first be coated with a cement grout. A typical specification for cinders for concrete reads:

"CINDERS shall be clean, hard, steam-boiler coal cinders, crushed to range in size from ¼- to ¾-inch (or 1-inch), and free from unburned coal or other substance injurious to concrete or its reinforcement."

Probably no building material is the subject of more controversy than cinders, principally because there is so much variation in them, and because it is impossible to make conditions for testing identical with those maintaining in all structures. The "personal element" in concrete construction stands out stronger with use of this aggregate than with use of any other. If cinders are specified, they must conform in general to requirements for other aggregate, the main variant being that of the substances in their composition, other than unburned coal, which would be "injurious to concrete or its reinforcement." Some writers mention sulphur in this category, but the prejudice against presence of that chemical appears to be unfounded. Perhaps the whole gist of the subject can best be summed up by quoting Professor C. L. Norton of the Massachusetts Institute of Technology: "Sulphur might (cause corrosion) if present, were it not for the presence of the strongly alkaline cement; but with that present the corrosion of steel by the sulphur of cinders in a sound Portland concrete is the veriest myth, and as a matter of fact the ordinary cinders, classed as steam cinders, contain only a very small amount of sulphur. There is one cure (for the rusting of steel in cinder concrete) and only one,—to mix wet and mix well. With this precaution, I would trust cinder concrete quite as quickly as stone concrete in the matter of corrosion."*

(1-b) *Cleanliness of Aggregates.* With the recent vast increase in the annual output of cement products, the preparation and handling of aggregates have become so commercialized that, even in rural communities, one generally finds them properly prepared for market by due grading and washing. The coarser material usually offered is crushed rock,—granite, trap rock, boulders, sandstone or limestone. Any of the first three will be clean if not in contact with earth nor stored too long. Sandstone or limestone will probably be covered by their own dust to such an extent as to need washing, and should be admitted only on that condition, assuming them to be otherwise acceptable. Sand and gravel, on the other hand, may be offered just as taken from the pit, hence must be carefully inspected. Up to a few years ago, concrete experts were accustomed to demand that sand and gravel must be close to 100 per cent clean, and one still encounters specifications containing this requirement. More recent authorities, however, have satisfied themselves that a small amount of clay, even up to 8 per cent of the volume of the sand, is not injurious and may even be beneficial.* But, in the use of both sand and gravel, one must be sure that a permissible silt content containing clay and sand doesn't also carry loam, organic matter, or oily substances.** Such material is not "clean," and will not make good concrete and should be washed. Some specifications stipulate that "the volume (of foreign substance) removed by decantation shall not exceed 3 per cent of the weight."*** While decantation means properly a laboratory test, it can also be performed in the field in a crude way by giving the aggregates a thorough washing and rinsing; pouring the dirty water into a vessel and allowing it to settle; then pouring off the clear water, and drying and weighing the residue; then comparing that weight with that of the bulk from which the dirt was removed. Some specifications stipulate that such objectionable matter shall not exceed 2 per cent, but the judgment of engineering committees permits the larger quantity. Care as to cleanliness of ingredients must be continued until they are actually incorporated in the work, and hence specifications require that all aggregates shall be deposited on plank floors or paving. If dumped on the ground, there will be "foreign substance" shoveled into the barrows or mixer in spite of all precautions. Water should also be clean, and this is generally so specified: "WATER for concrete shall be clean and free from injurious amounts of oil, acid, alkali, organic matter or other objectionable content." Ordinary drinking (potable) water is always fit for the purpose, as is rain water that has not picked up too much improper admixture from surfaces with which it has been in contact. Any water under suspicion should be sent to the laboratory for analysis.

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* Report No. 9 Insurance Experiment Station, Boston Manfrs. Mut. Fire Ins. Co. in Kidder's "Architects' and Builders' Pocket-Book," page 882e.

* "Reinforced Concrete and Masonry Construction," Hool & Kinne, page 4.

** These are subjects for laboratory tests; see pages 726 and 727 in Hool & Kinne's "Reinforced Concrete and Masonry Structures."

*** "Tentative Specifications for Concrete and Reinforced Concrete" by the Joint Committee on Standard Specifications for Concrete and Reinforced Concrete of the American Society of Civil Engineers. American Society for Testing Materials, American Railway Engineering Association, American Concrete Institute and the Portland Cement Association.

(1-c). *Size and Shape of Aggregates.* Specifications for broken stone (crushed rock) and gravel call for a range in size from ¼- or ⅜-inch up to ¾- or 1-inch for reinforced work, and up to 1-inch, 1½ inches or 2 inches for plain, mass or rough concrete.* Some specifications, notably for bridge.** and railway work (and including that we are using), permit the embedding of large pebbles or stone weighing up to 100 pounds in mass concrete, under certain restrictions. The superintendent can readily adjudge the sizes of the aggregates, since minor variations are unimportant. When it was customary to specify the maximum size as that of a piece that would pass through a ring of given diameter, grading screens were perforated sheets with holes to comply. But this refinement is being abandoned, and use of the "ring" specifications is disappearing. Screens of square wire mesh are now in as common use as those with round holes.

Insistence upon sharpness or angularity of aggregate has been customary from the time when concrete was mortar with coarse aggregate added, the former made with hydraulic or other cement which adhered to angular or rough surfaces better than to those that were round or smooth. Fractures of concrete made of gravel and Portland cement, however, disclose cleavages through round pebbles, rather than around them; hence "sharpness" of aggregate is no longer demanded. The one objectionable shape of aggregate is the thin and laminated. The presence of many of these will seriously cut down efficiency, especially in reinforced work.

(1-d). *Aggregates to be Well Graded.* This is insisted upon in both sand and coarse aggregate, and is essential to density. If one were to attempt to make concrete with a single size of coarse aggregate and a single size of sand, it would take too much sand to fill the interstices for economical construction. Even "grading" means that all interstices will be filled by largest size pieces, from coarsest to finest. Graded sand for the purpose (sometimes termed "torpedo" sand) should conform to this specification: "SAND shall range in size from fine to coarse, and the percentage of weight of sand retained when passing through standard screens shall be at least 100 per cent on a No. 100 sieve, 80 per cent on a No. 50, 25 per cent on a No. 40, 10 per cent on a No. 20 and none on a No. 10."

These proportions are varied somewhat by different authorities* but will be found generally practicable as given. Finer sand will make good concrete (though quite unsuitable for mortar), but it demands an undue amount of cement.

(1-e). *Aggregates to be of Adequate Hardness.* If doubt exists as to the hardness of the aggregates, samples should be sent to the laboratory. Ordinarily, granite and gravel pebbles are safe enough; limestone and sandstone are open to doubt, but "no type of aggregate such as granite, gravel or limestone can be said to be generally superior to all other types. There are good and poor aggregates of each type."**

(1-f). *Aggregates to Have Due Moisture Content.* The ratio of water in aggregates, prior to their being put in the mixer, is of less import than that the moisture content shall be known and that the water added shall be proportioned accordingly. It is always well to use a hose on the material in the pile just before using, both to carry off the dust and, in the case of porous stone, slag, brick, tile or cinders, to prevent the later absorption of too much thin cement.

(2). *Proportions to be Such as to Produce the Maximum Density of Each Type Called For.* The ratios of concrete ingredients most commonly used are 1:1½:3 or 1:2:4 for reinforced work and 1:2½:5 or 1:3:6 for plain or non-reinforced. The workable compressive strengths of variously composed concretes (other than cinder concrete) are from 1,500 to 3,000 pounds per square inch, dependent upon the ratios of cement and fine and coarse aggregate, the moisture content, the excellence of the mix, and the thoroughness of the compacting.*** Unfortunately, the "personal element" in the making of concrete is its most outstanding characteristic. It is easy to make good concrete, but still easier to use careless methods and produce inferior work; hence one reason for the unduly large number of failures in this construction. From the ratios here given, it is seen to be a general assumption that it takes about half as much sand as coarse aggregate in order to fill the voids in the latter. Such being the case, it is apparently inconsistent to name 1:2:4 and 1:3:5 in the same specification, as is done in some localities,—notably in Chicago. Obviously, if 1:2:4 is correct for a rich concrete, then a 1.3:6 mix with similar materials will produce cheaper concrete than 1:3:5 and of equal strength.

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* Some specifications refer by number to commercial sizes of aggregates which are rated thus:—
No. 1 crushed rock, graded up to that which passes a 3-inch sieve.
No. 2 do., graded from a 1-inch sieve up to a 2-inch sieve.
No. 3 do., graded from a No. 4 sieve up to a 1-inch sieve.
No. 4 do., graded from a No. 16 sieve up to a No. 3 sieve.
(All sizes assumed to be standard meshes.)

** "In large masses of concrete one-man stones may be employed, provided that they first be cleaned and wetted thoroughly, and provided that they be not placed any nearer than six (6) inches to each other or to the exterior of the construction." Dr. J. A. L. Waddell in "Bridge Engineering," page 1852.

* See pages 6 to 11 of "Reinforced Concrete and Masonry Construction." Hool & Kinne.

** Technology Paper 58, U. S. Bureau of Standards.

*** See the "Progress Report of the New Joint Committee on Standard Specifications for Concrete and Reinforced Concrete," Appendix F in Hool & Kinne's "Reinforced Concrete and Masonry Structures."

The main task for the superintendent is to assure himself that the ratios fixed in the specifications will produce concrete of maximum density with the materials at hand. As to this, the specifications say:

"VARIATIONS. The proportions given for the various kinds of concrete are based upon the use of well graded aggregates, as specified. In case the aggregates are not so graded, the Architect may change the proportion of cement to fine aggregate, without changing the proportion of cement to coarse aggregate and without additional compensation to the Contractor. No gravel (pit-run or other) shall be used until the Architect has had opportunity to test same and to determine what additional coarse or fine aggregate is to be added to such gravel, or if any addition is necessary. The Contractor shall conform to such demands to produce concrete of maximum density and shall not permit a change in the character of aggregates delivered at the site without due notice to the Superintendent and revised instructions as to procedure."

The indeterminate feature of this, insofar as pit-run material is concerned, is that there is no positive statement as to the proportion of such aggregate that will be the equivalent of what is specified. There seldom is, in any specification, and so there exists a cause for argument that could as well be eliminated. It should be clear enough, since one purpose of using the finer material is the filling of voids in the coarser aggregate, so that, if ratios are correctly specified, the bulk of the mix will only slightly exceed that of the coarse aggregate, and hence a 1:3:6 ratio becomes 1:6, if the aggregates are delivered ready mixed. Nevertheless, a young inspector may be surprised to find the contractor and all his mechanics insisting that a 1:3:6 mix is equivalent to 1:9, with pit-run material. Being faced by more experienced men, the novice may be much embarrassed in his contention, if he finds nothing specific in the contract documents on the subject and can lay his hand on no other authority to back him up. The truth is that not enough attention is ordinarily given to obtaining precisely correct proportions of aggregates, except for very important work.*

On this subject, the Portland Cement Association, in its publication, "Concrete Data for Engineers and Architects," says: "A 1:3:5 nominal mix does not give a 1:8 true mix as sometimes assumed, but about a 1:7 true mix." This means that the "true mix" should be computed at 40 per cent more than the bulk of the coarse aggregate, whereas the author's contention is that it should be only about 10 per cent additional, that is, 1:5½. Supporting the Association's statement, their authority, Prof. D. A. Abrams, says further: "As a matter of fact, instead of filling the voids, a coarser particle in fine aggregate will actually separate the particles of coarse aggregate farther than they would be normally. This is the reason it is necessary to use a considerable portion of sand, more than the theoretical amount required to fill voids. In any section of concrete which has been cut, one will note that in general aggregate particles are floating in a cement-water mixture. It is for this reason that the cement-water ratio becomes of controlling importance. Within the usual range of quantities, the volume of mixing aggregate will be about 85 per cent of the total volume of the fine and coarse aggregate." From which it will be seen that the ideal and surest way of stating the desired amount of cement would be to give its ratio per cubic foot of finished concrete; then to use the cement-water ratio for ascertaining desirable percentages of aggregates and moisture.

Given his design and proportions, the superintendent must know that the materials to hand are such as will properly "fill the bill." He can measure the voids in the coarse aggregate by filling a vessel with a known quantity, then pouring in enough measured water to fill to the same level. The amount of sand used should be slightly in excess of the quantity of water. In other words, if half as much sand as coarse aggregate is called for, then it is assumed that the voids in the latter are about 45 or 48 per cent of its bulk. Voids in the sand can be measured the same way and should run 25 to 40 per cent. Measurements should be by weight, and the water should be weighed before being poured in, since capillarity will prevent its all being drawn off. To ascertain roughly whether or not pit-run material contains a proper grading of all the aggregates, it is necessary to separate the fine and coarse by screen with a ¼-inch mesh sieve, then measuring the quantities of the two sizes and the voids in the larger, in the manner just described here.

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* For proper proportions of concrete ingredients, see "Concrete, Plain and Reinforced," Taylor & Thompson, Hool & Johnson, F. E. Kidder and other standard authorities; including "Design and Control of Concrete Mixtures," published by the Portland Cement Association, Third Edition, January, 1929.

(*To be continued*)

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IN TWO PARTS

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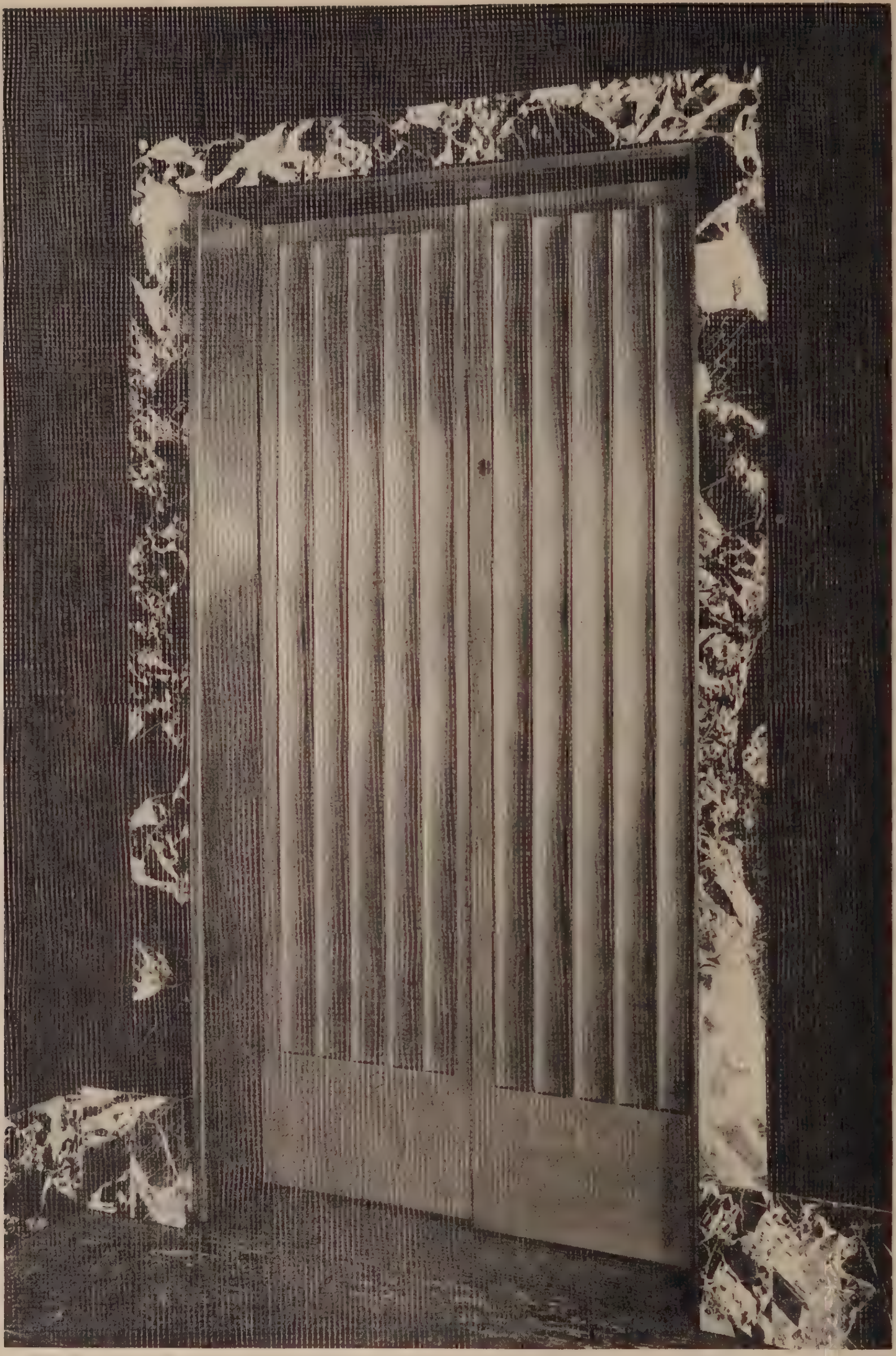
ARCHITECTURAL DESIGN

SEPTEMBER
1929

INDUSTRIAL BUILDING REFERENCE NUMBER
PRICE $3.00



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THE BUTTERICK BUILDING, NEW YORK
RUSSELL G. CORRY, *Architect*
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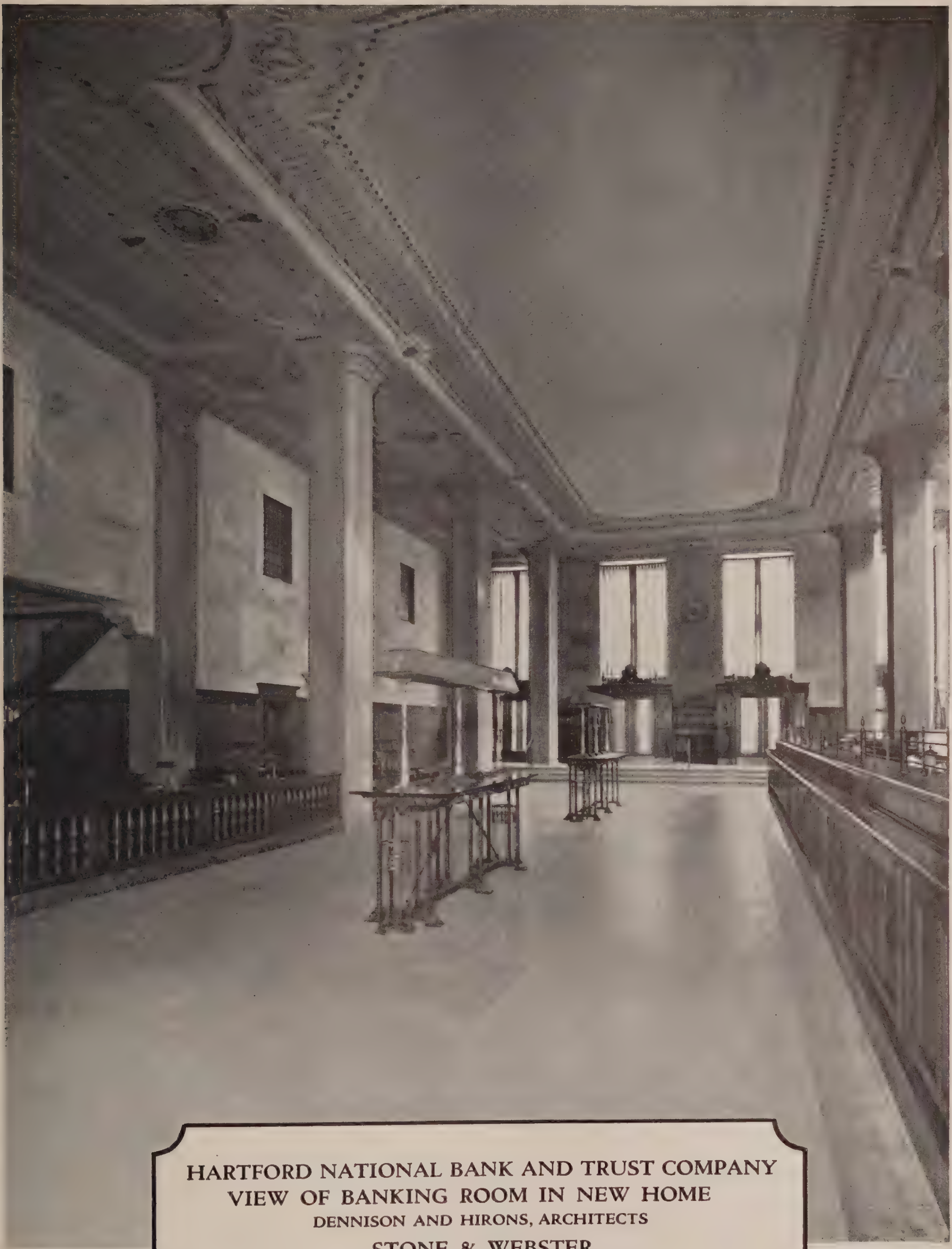
ELEVATOR CARS

TYLER
THE TYLER COMPANY, Cleveland, Ohio

ELEVATOR ENTRANCES



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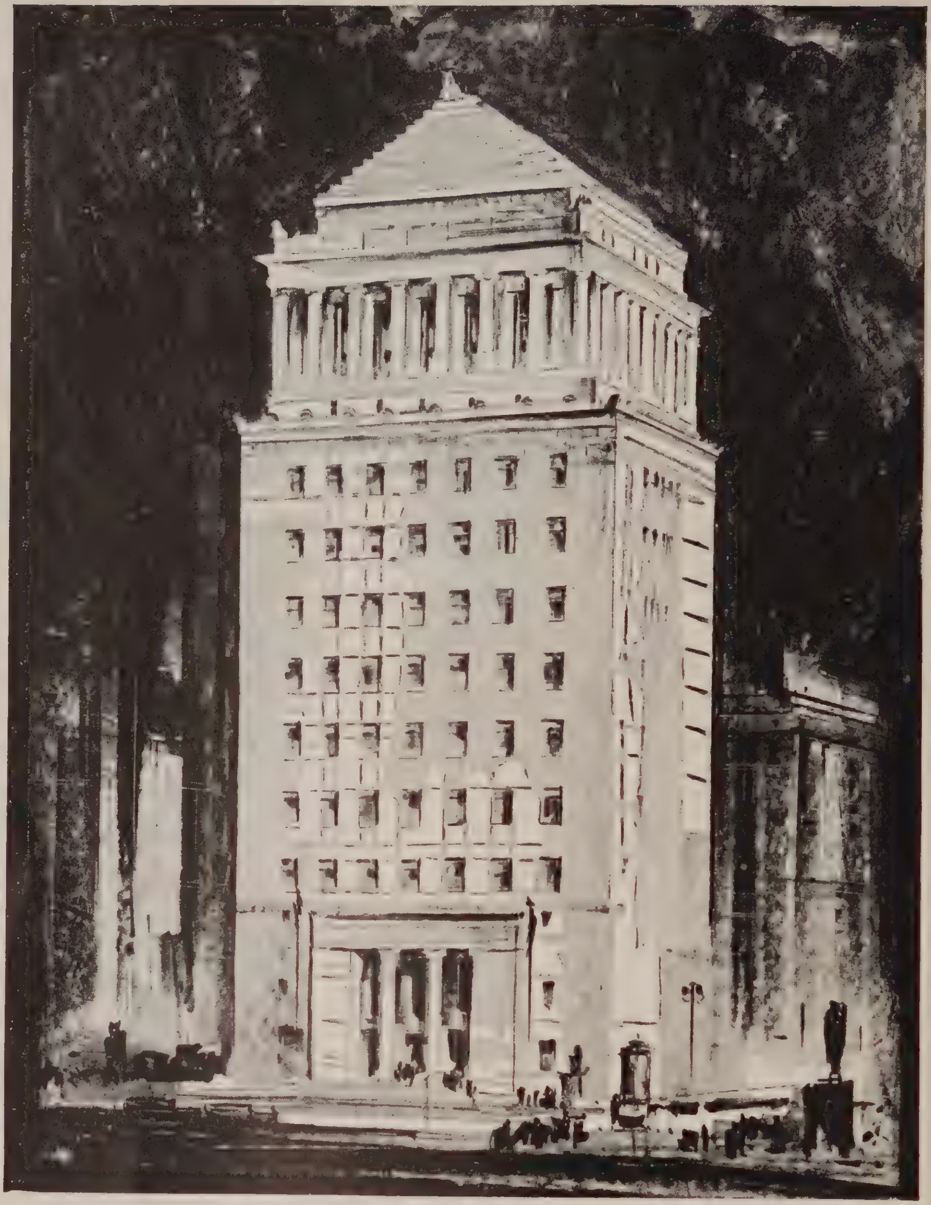

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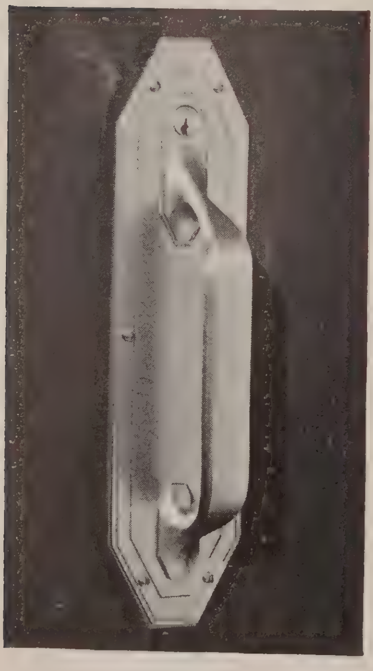

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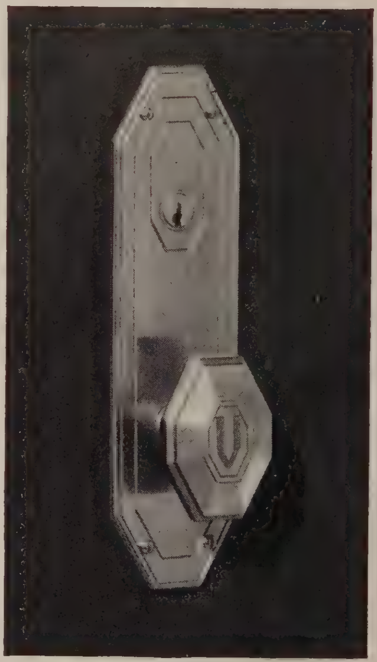

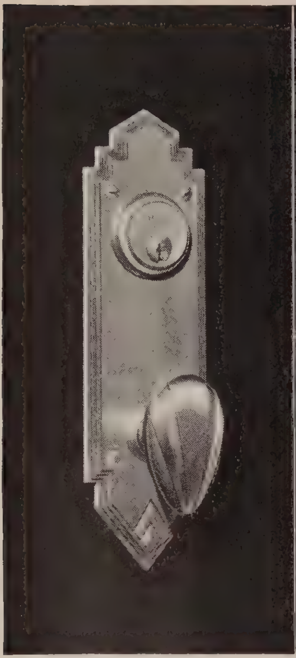

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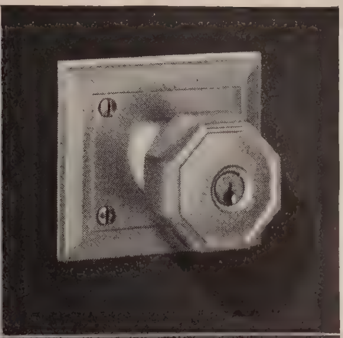
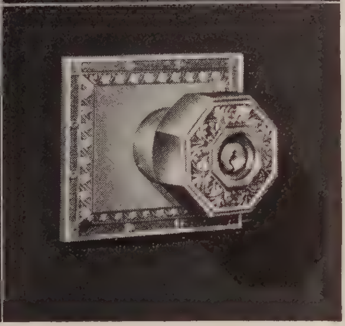


Union Lockset — Knob No. 9805½ MP, *without demountable feature; No.* 19805½ MP, *with demountable knob and exchangeable cylinder.*



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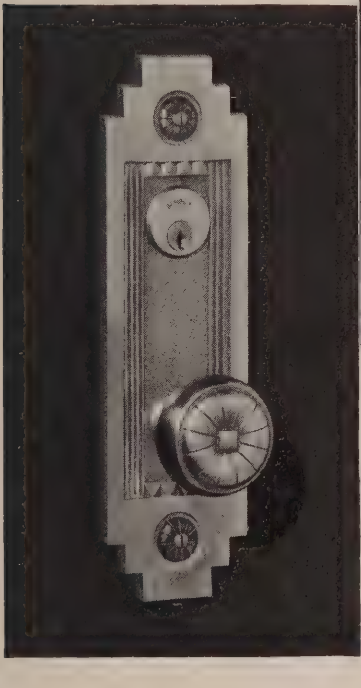

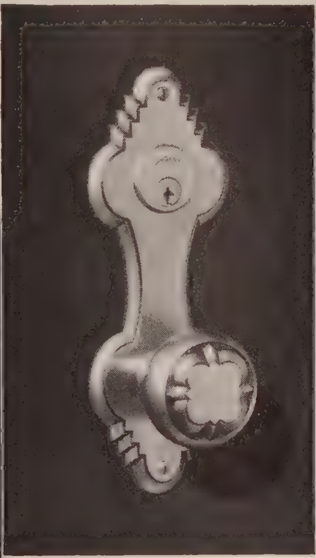

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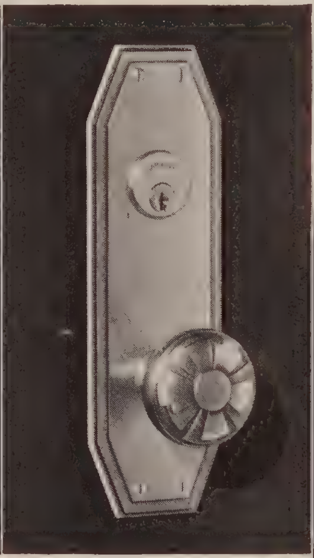

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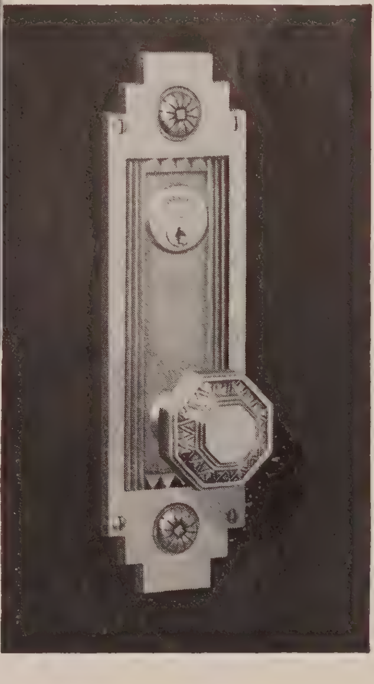

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BOOK DEPARTMENT

MINOR ARCHITECTURE OF SUFFOLK

A REVIEW BY

ROBERT STUYVESANT HOOKER

Of all England no district is richer in historic tradition, natural scenic beauty, and good architectural precedent than Suffolk. Since the time that William the Conqueror became king and divided Suffolk into 629 manors and apportioned them among his followers, Suffolk has been the scene of great political and industrial activity. It has suffered at the hands of intriguing barons and has been the home of many of the great public characters of English history, and of countless home-loving country squires, farmers and peasants whose homes ranged from the simplest cottage to the most imposing of castles, many of which are still existing.

The Norman conquerors upon coming into possession of the land immediately started building themselves great castles including those at Bungay, Clare, Eye, Framlingham and Haughley. At the same time an astounding number of monastic buildings were being erected in the district, including Gilbert Blount's priory at Ixworth in 1100; Ralph Fitz Brian's priory at Great Bricett in 1110; the monastery of Hubert de Montchensey at Edwardstone in 1114; the convent at Redlingfield in 1120, and many other such buildings. But there was much internal strife between the barons and kings, and the people were mistreated and plundered so that the period was productive of great fortress-like castles which were the prey of all invaders and therefore were thrown down and destroyed in so many instances that today we scarcely have an idea of what they were like. On the other hand, the poverty stricken condition of the population did not lend itself to the development of an important growth of domestic architecture. Domestic building flourished at a later date, after Suffolk had become commercially prominent, largely through the introduction of the woolen industry in 1336. This industry, introduced by the Flemings and vigorously followed by the natives, was in a great measure responsible for the exceptional prosperity enjoyed by Suffolk over a long period of time. Although comparatively few Flemish people settled in Suffolk, there is a marked Flemish influence in the architecture of the period. The prosperous people built themselves comfortable cottages, and the squires and merchants erected great halls and country estates which include some of the best examples of English architecture. Of these great halls and manor houses many remain today as homes of the wealthy; others have fallen from their lofty estate and serve as farmhouses,

"CHURCH BUILDING"—*By Ralph Adams Cram*

(A NEW AND REVISED EDITION)

THE improvement which has accompanied the progress of American architecture during recent years has been no more marked in any department than in that of an ecclesiastical nature. This has been due primarily to the rise of a few architects who by travel and study have acquired much of the point of view from which worked the builders of the beautiful structures which during the fourteenth century and the fifteenth were being built over all of Europe.

These architects have closely studied the churches, chapels, convents and other similar buildings in England, France, Spain and elsewhere, and the result has been a number of American churches of an excellence so marked that they have influenced ecclesiastical architecture in general and have led a distinct advance toward a vastly better standard. This improvement has not been exclusively in the matter of design, for plans of older buildings have been adapted to present-day needs, and old forms have been applied to purposes which are wholly new.

THE appearance of a new and revised edition of a work which is by far the best in its field records this progress. Mr. Cram, being perhaps the leader among the architects who have led this advance, is himself the one individual best qualified to write regarding the betterment of ecclesiastical architecture. The editions of this work of 1900 and 1914, which have for some time been out of print, have now been considerably revised and much entirely new matter has been added, which in view of the change which has come over ecclesiastical building of every nature is both significant and helpful.

Illustrations used in this new edition of "Church Building" show the best of recent work—views of churches and chapels large and small, in town and country, buildings rich in material and design and others plain to the point of severity, with the sole ornament in the use of fine proportions and correct lines. Part of the work deals with the accessories of the churches and their worship.

345 pages, 6x9 inches, Price $7.50

THE ARCHITECTURAL FORUM, 521 Fifth Avenue, New York

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College Architecture in America

Its Part in the Development of the Campus

By

CHARLES Z. KLAUDER *and* HERBERT C. WISE

Music Building, Smith College
Delano & Aldrich, Architects

A NEW and ever higher standard is being established for the architecture of educational structures of all kinds. Some of the most beautiful buildings in all America are those venerable halls in academic groves in Charlottesville, Cambridge, Princeton and elsewhere built by early American architects, and now after long decades of indifferent designing and careless planning American architects are rising anew to the situation and are designing educational buildings of every type which closely rival even the best work of a century ago, while in planning and equipment they establish a standard which is wholly new.

¶ In this valuable and important work two widely known architects of educational buildings collaborate in reviewing the entire situation as it applies to college and collegiate architecture. They have carefully studied practically every important institution in the country, and in their text they discuss administration buildings; dormitories; recitation halls; chapels and auditoriums; gymnasiums; libraries; and structures intended for certain definite and specific purposes, such as the teaching of music, all this being well illustrated with views of existing buildings and in many instances with floor plans and other drawings. A valuable and extremely practical work to add to the equipment of any architect's office.

301 pp., 7½ x 10 ins.
Price $5, Special Net

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while still others have fallen to ruin and have disappeared. The cottages themselves have also suffered the ravages resulting from the march of progress, and as is the case in America, fine old structures are ruthlessly torn down to make room for ugly buildings of a more up-to-date type. In a great majority of cases the charm of English cottage and farmhouse architecture lies in its severe simplicity, the work of construction having been done in most instances by local craftsmen using local, or easily transported materials, such as brick and timber, which resulted in the interesting and ever popular half-timbered type of building so characteristic of English architecture. The half-timber work found in Suffolk is perhaps more pleasing than that of any other district of England in that it seems to possess a solid, honest quality often lacking in the houses of other districts. Another feature of the Suffolk buildings is the great variety in the color of the brick which, though not always pleasing, in a great majority of cases lends added charm to the work. It is in this brick work that the Dutch, Flemish and Huguenot influence is most strongly felt, and there are many buildings in Suffolk with very decidedly foreign lines which serve to heighten the variety and interest of the general architectural effect.

As is to be expected in a country so rich in architectural precedent, eagerly sought by the modern architects of two continents as inspiration for their own designs, the English countryside and cities have been combed and recombed, and photographed and sketched from every angle. There is a tendency, however, for the busy architect or student who has limited time for travel and wishes to cover during that period the greatest possible extent of territory, to keep to the beaten paths and easily accessible landmarks. Indeed for one to cover in anything like a complete manner the whole of the English countryside, it might well be necessary to spend a lifetime. It is in the cities and more frequented places that the greatest destruction due to modernization has taken place. However there are still numerous forgotten little villages hidden away along the byways and among the fields where the hand of progress has rested lightly, and where one may still find "Old England" unspoiled. Such a search, however, requires infinite patience and unlimited time not in the realm of possibility for most of us, so that we must be content with collections of illustrations and descriptions by those who have had the opportunity of making a special study and investigation of the subject, and already several such works have appeared.

Such a collection on the subject of English architecture is being prepared to cover the entire field in as complete a manner as possible, presenting photographically the domestic architecture of old England in two main divisions,—one on the major architecture, including castles and mansions, and the other devoted to minor architecture such as manor houses, cottages and farm houses. The material will be grouped as far as is possible by counties, depending on the amount of material available as to whether one or more counties shall be dealt with in one volume. In the case of Suffolk it was found that there existed such a wealth of material that in the preparation of the volume entitled, "The Minor Architecture of Suffolk" it was possible to include only a part of the illustrations available. This of course permits of a greater selectivity, so that only the best of a

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large number of examples appear in its pages. The work is edited by Dexter Morand and is made up almost entirely of full-page plate illustrations in collotype from original photographs made especially for this volume. The introductory text matter gives a brief description and discussion of the architectural character of the Suffolk countryside and the conditions under which its development took place. There is also a short monograph on the manner of seeking out secluded places and locating the best examples of work typical of the old English styles. The historical notes are quite complete and have been carefully compiled by investigation of a great quantity of source material. They deal with all the events of English history occurring in Suffolk from the time of William the Conqueror down to the reign of Queen Mary. These events are presented in such a way that their bearing on the architectural development of the country is made evident, and the reader is given a historical background against which to view the architectural subjects which follow.

As is always the case in a work of this character, it is the plates in which architects are principally interested, and in this instance they are well worth careful study. A brief description of a few chosen at random will perhaps help in giving an idea as to the nature of the subjects shown. At Aldeburgh, Moot Hall is an unusual combination of half-timber, stucco and brick. The beauty of the general proportions is perhaps marred by the towering chimney with its two octagonal pots. However, the detail of this chimney is so interesting that as a source for precedent it offers great possibilities. At Bildeston a small cottage with its entry opening directly onto the street presents an interesting arrangement of windows, and the overhanging second story with timber brackets relieving the blankness of the white stucco facade affords many suggestions. Two other roadside cottages of Bildeston, with shop windows on the first floor and projecting upper stories, are also shown. A half-timbered cottage at Chelsworth is placed end-on to the street and flanked by a low brick wall with white picketed gate. The heavy thatched roof adds a touch of ruggedness. At East Bergholt, the Bell Cage is notable chiefly for the shape of its roof which suggests an interesting way of terminating a long, narrow cottage roof. Three photographs taken at Flatford showing the Valley Farm, Constable's Mill, and a heavily thatched cottage by the side of the stream are more interesting for the scenic beauty of the settings than as architectural material. The treatment of the brick filling in the half-timber of one side of the Fox and Goose Inn at Fressingfield presents an interesting variety of patterns, and the general proportions of the structure are very satisfying. Hadleigh with its interesting Guild Hall and many cozy little shops offers a wealth of material, and the several illustrations here shown are well chosen for the purposes of the architect. From Hintlesham we have a snug little white walled cottage nestling behind its hedges and white picket fence, and a larger half-timber building of the manor house type. Ipswich was at one period among the most prosperous cities of England, and "Ye Olde Neptune Inne" and numerous other shops and buildings offer a wealth of detail and interesting material. The author of this work refers to Kersey as "as charming and unspoilt a village as exists in England, without visiting which no architectural pilgrimage in

"*International Airports*"

By Stedman S. Hanks

Lieutenant-Colonel Air Corps Reserve

The rapid development of commercial aëronautics is presenting to American architects what bids fair to becoming an excellent opportunity for using skill in designing, constructing and equipping airports. The subject has hitherto received but little attention in the architectural press, and but few works on the subject have been published.

* * *

In this volume a highly trained and experienced aëronaut reviews the subject. He considers the problems of American airport development from a study of what has been done abroad against the background of the author's intimate knowledge of airport conditions here. In its preparation, Colonel Hanks made a prolonged tour of European airports for the purpose of learning in what ways their experience can serve as a guide for airport construction in the United States.

* * *

In making his study he received the assistance of many leaders in European aëronautics and enjoyed exceptional facilities for thorough investigation. Much information on the details of foreign airport operation is accordingly given that has never before been available in published form. The design, construction, and management of the outstanding airports is described and compared with that of the airports in America. Up to the present time, Europe has led the world in air passenger traffic. Colonel Hanks discusses passenger facilities at airports, tickets, baggage regulations, transportation of passengers to and from airports, and other details of European passenger practice. He considers also the problem of developing the transportation of freight by air and tells what has been done in Germany in the inauguration of combination air and rail service for express shipments.

* * *

The opportunities for substantial additional revenue to the airport from supplying recreational facilities and other adjuncts of the modern resort; an outline of an ideal airport combining the best features of successful American and European practice; a typical airport profit and loss statement; airport regulations; are other valuable features of this book.

195 pp., 5¾ x 8½ ins. Price $5.

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Suffolk would be complete." Indeed the scenes here shown would make excellent stage settings for a Shakespearean drama. Some primitive wood carving over a shop front at Halesworth furnishes the subject for excellent detail, and a massive wrought iron studded door from Kersey is a marvel in sturdiness. The Lavenham Guild Hall is unusually interesting and rich in detail, though the half-timber work would very likely become extremely monotonous were it not for the numerous leaded glass windows and the carved detail of the beam at the projection of the upper story. The corner posts of the building are also richly carved, and a close-up view presents the detail quite distinctly. The Wood Hall and other buildings at Lavenham are rich in half-timber work and interesting arrangement of parts. Although the front facade of the Bull Inn seems a slightly jarring note among so much architectural perfection, its courtyard is charming and reminiscent of other days. One of the most pleasing bits of domestic architecture is shown from Monks Eleigh. This is a severely simple little cottage with thatched roof and plaster walls. Much of the credit for the effect of this illustration may be due to the setting, but the general effect is extremely beautiful and satisfying. The shops and cottages of Woodbridge contain a great deal of good half-timber arrangement and are characterized by the informal spacing and placing of windows and doors, which is responsible for much of the charm in old English architecture.

MINOR ARCHITECTURE OF SUFFOLK. Series One. By Dexter Morand. Text and 48 Plates, 9 x 12½ ins. Price 17 s 6 d. John Tiranti & Co., 13 Maple Street, Tottenham Court Road, London. (Orders to be sent directly to publisher.)

STRENGTH OF MATERIALS. By Jasper Owen Draffin. 275 pp., 6 x 9 ins. Price $3. John Wiley & Sons, Inc., 440 Fourth Avenue, New York.

THE author of this valuable work is Assistant Professor of Theoretical and Applied Mechanics at the University of Illinois. "The book was written as a result of an effort to find a suitable text-book on strength of materials for those engineering students, particularly architects, who have not studied the calculus. It embodies the experience of a number of years of teaching such students. A knowledge of algebra, trigonometry, and of theoretical mechanics, indulging centroids and moment of inertia, is presupposed. The topics discussed are those which are commonly taught engineering students in undergraduate courses in strength of materials. A few equations, such as Euler's column formula and the theorem of three moments, are stated and applied but are not derived. Deflection is studied by means of the areas of the shear, moment, and slope diagrams. The area of a plane surface bounded by a curve is computed by elementary calculus, the principles of which are outlined in an appendix. One chapter is devoted to a brief treatment of energy and repeated loads. Reinforced concrete beams are discussed as an example of beam action, and beams are designed and investigated with the derivation or use of many of the usual formulæ.

"Many problems are included, most of which are of a type met in practice but with the details simplified to emphasize principles. The problems are planned to assist in cultivating the judgment of the student in selection and use of data and in the reasonableness of the results."

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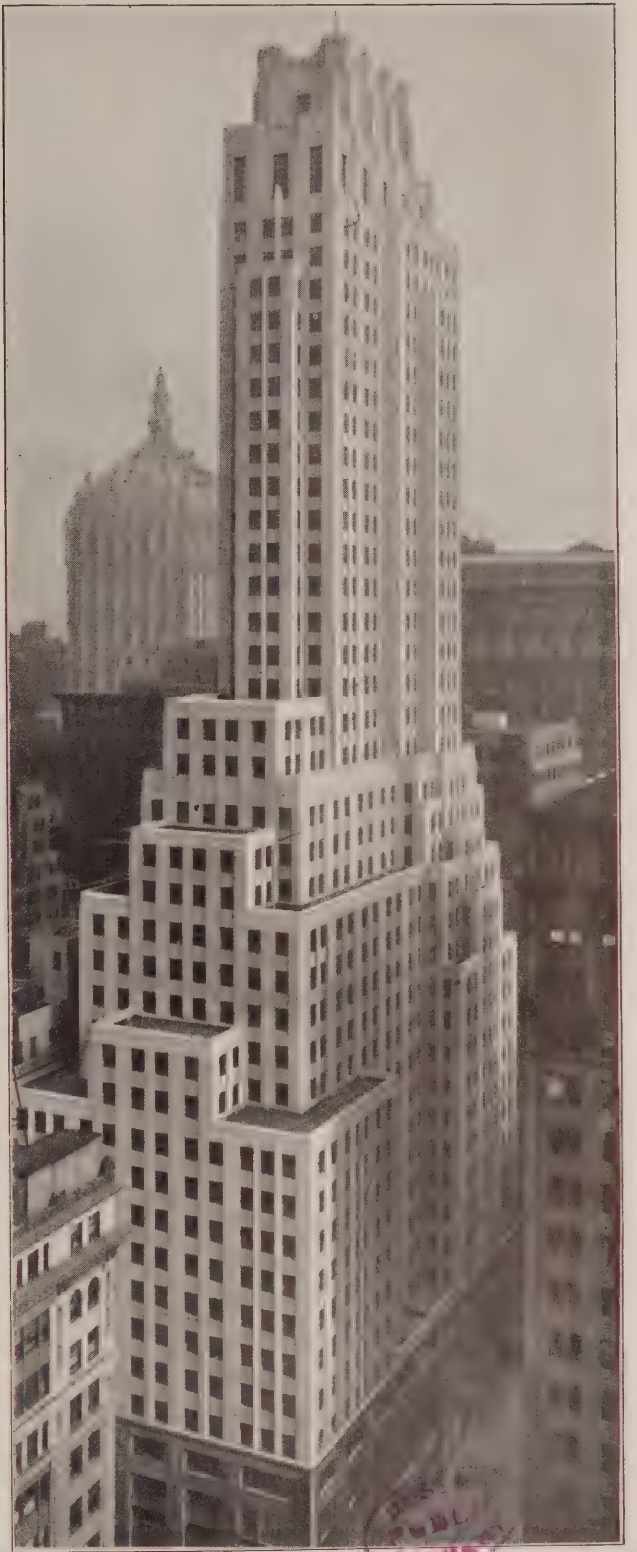

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But this Telesco display is only one reason why a visit will repay you. Come in and see the Director's Room, beautifully paneled in walnut. Come in and see the newest ideas in bank equipment. Come in and see the office furniture, *especially* the custom made desks, tables and bookcases. One architect after looking around, said his visit was really a liberal education!

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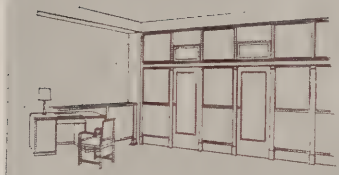

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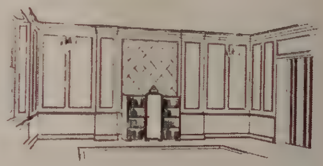

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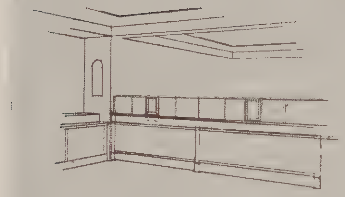

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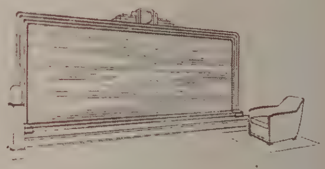

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THE EDITOR'S FORUM

BRITISH ARCHITECTS VISIT NEW YORK

ALTHOUGH foreign architects frequently visit our shores to more adequately familiarize themselves with what American architects are doing today, the recent visit of a group of leading English architects, members of the Royal Institute of British Architects, was a real compliment to the profession in this country. Although this visit of professional brethren from across the sea was far too brief to show them adequate hospitality or to give them more than an airplane view of the splendid examples of modern and classical architecture completed by us during the past ten years, everything possible was done to entertain these delightful gentlemen from England and to facilitate their progress through our architectural centers. During their brief visit of three days in New York, William A. Delano, President of the New York Chapter of the American Institute of Architects, entertained the visiting British architects at a small and informal luncheon at the Century Club. This sociable and delightful occasion gave an opportunity to a number of New York architects to meet and exchange ideas with this group of interesting and prominent British architects. The group consisted of Percy Thomas, Victor Wilkins, D. M. Laird, S. W. Davis, Laidlaw Smith, H. B. S. Gibbs, J. Gibson, and J. Parnie Dansken, Vice-president of the Faculty of Surveyors of Scotland.

It is sincerely to be wished that such meetings of British and American architects could occur more frequently. They would tend to produce a better understanding and a mutual appreciation and esteem and interchange of ideas between men who practice architecture on the opposite shores of the Atlantic.

A HOSPITAL COMPETITION

ARCHITECTS of New York are invited to enter into competition for the compilation of plans for the construction of a million dollar hospital plant, devoted exclusively to the health and welfare of women of the Bronx. The hospital is to be erected for the Bronx Maternity Hospital, on the site of its present building, 166th Street and the Grand Concourse, it was announced by Dr. Julius Wise, chairman of the building committee and consultant in charge of plans. Details of the desires of the board and advice and suggestions as to procedure will be given architects interested in the contest by Dr. Wise, who maintains offices at 748 Kelley Street, the Bronx.

The building will front 92 feet on the Grand Concourse and about 100 feet on East 166th Street. It will be a ten-story structure, ultra-modern in design and equipment, with a capacity of 250 beds. The design will run chiefly to wards, according to Dr. Wise, in order that facilities may be made available to the public at the lowest cost consistent with good service.

HENRY FORBES BIGELOW—1867-1929

FROM Boston comes the sad news of the death of another prominent architect, Henry Forbes Bigelow, who for many years has been one of the leaders of his profession in New England. He was graduated from St. Mark's School and later from the Architectural School of the Massachusetts Institute of Technology. For many years Mr. Bigelow has been a trustee of the Boston Museum of Fine Arts and, together with his partner, Philip Wadsworth, has built many important city and country houses in his native state, as well as the Hotel Touraine and the National Shawmut Bank in Boston, and the buildings for St. Mark's School. Possessed of a genial personality and a deep interest in his profession, Mr. Bigelow will be greatly missed by his many friends and by his professional associates.

A WAR MEMORIAL COMPETITION

THE War Memorial Committee of Chicago, consisting of W. Rufus Abbott, Sewell L. Avery, Gen. Abel Davis, Gen. Milton J. Foreman, Gen. Roy D. Keehn, Robert P. Lamont, Robert R. McCormick, Julius Rosenwald, Howard P. Savage, James Simpson (ex-officio Chairman of the Chicago Plan Commission), Albert A. Sprague and Walter Strong, desires to announce that a nation-wide competition will be held for the Chicago War Memorial, with attractive prizes and in accordance with the usage of the American Institute of Architects. Programs will be issued September 1 and judgment announced early in December. Under this general invitation programs may be obtained up to October 1 by qualified applicants from Earl H. Reed, Jr., Professional Adviser, 435 North Michigan Avenue, Chicago.

AN ARCHITECTURAL EXHIBITION

THE Philadelphia Chapter of the American Institute of Architects and the T Square Club will hold their 32nd annual architectural exhibition from November 1 to 15 inclusive. The joint exhibition board of the affiliated organization has announced that the exhibition will this year, through the courtesy of John Wanamaker, Philadelphia, be held in the well appointed art galleries of that firm.

A circular of information giving full details is now available which, together with entry slips and labels, may be had upon application to the Executive Secretary, at his office, 112 South 16th St., Philadelphia.

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THE ARCHITECTURAL FORUM

VOLUME LI
SEPTEMBER 1929

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MILTON BENNETT MEDARY
1874-1929

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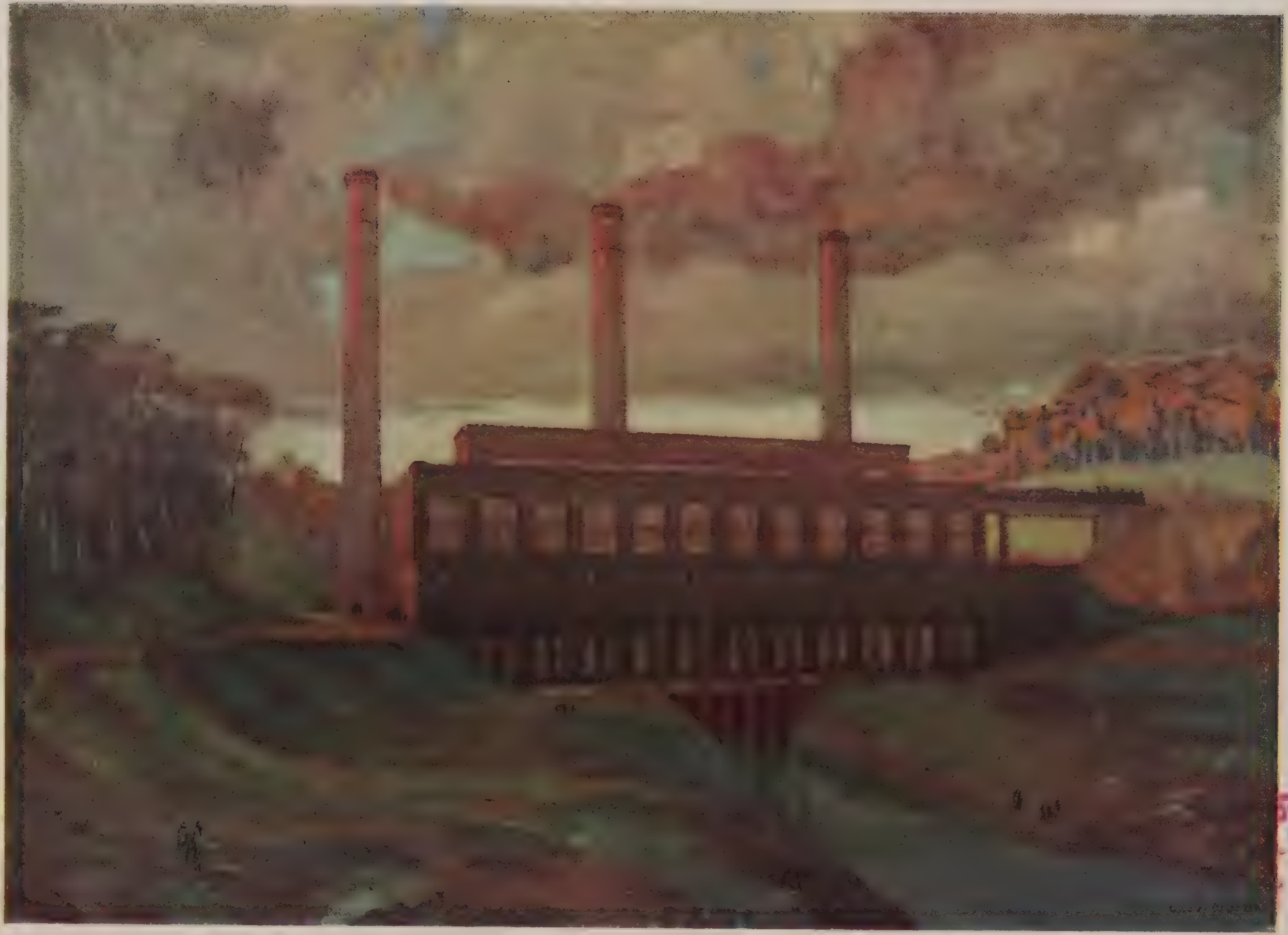
MILTON BENNETT MEDARY

1874—1929

BORN in Philadelphia on February 6, 1874, Milton Bennett Medary upon the completion of his school days entered the University of Pennsylvania, from which he was graduated. Four years later he formed the firm of Field & Medary, in which he was active in the practice of architecture until 1905. Following the dissolution of this firm, Mr. Medary worked alone until the formation, five years later, of the firm of Zantzinger, Borie & Medary, with which he was associated until his death. Mr. Medary was the designer of many important buildings in Philadelphia and in other parts of the country. Among his most recent achievements was the Carillon Tower, which he built for Edward W. Bok in the Bird Sanctuary at Mountain Lake, Fla.; the Pennsylvania Athletic Club; the Valley Forge Chapel; and the Fidelity Mutual Life Insurance Company's building in Philadelphia.

Milton Bennett Medary was for many years a leader in his chosen profession. Among the many honors accorded him were the degree of Doctor of Fine Arts from the University of Pennsylvania in 1927; the Presidency of the American Institute of Architects from May, 1926, to May, 1928; he was a director of the Foundation for Architectural and Landscape Architecture of Lake Forest, Ill., and was appointed a member of the National Commission of Fine Arts by President Harding in 1922, of the National Capital Park and Planning Commission by President Coolidge in 1926, and of the Board of Architectural Consultants of the Treasury Department by Secretary Mellon in 1927. He served as chairman of the Housing Corporation of the Department of Labor, and was appointed to design and construct workmen's villages at Neville Island, Pittsburgh, and Bethlehem, Pa., in 1918. He was consulting architect to Cornell University, Mt. Vernon on the Potomac, and the Roosevelt Memorial Association. While president of the American Institute of Architects, Mr. Medary took a great interest in directing the attention of the Institute to its powers of beneficial action in warning the public of commercial encroachment on places of great natural beauty. In October, 1927, the executive committee of the Institute adopted a resolution condemning establishment of any power development in the gorge of the Potomac River or in the Great Falls district of Washington, because it would destroy one of the beauties of the national capital. Such guarding of natural beauty Mr. Medary held to be a duty imposed on the architects of the entire country. In Philadelphia he was at one time president of the local chapter of the American Institute of Architects, the T Square Club, and of the Architectural Alumni of the University of Pennsylvania. He was a member of many other architectural societies, among which were the Philadelphia Zoölogical Society, and the American Game Protective Association. He was an honorary member of the American Society of Landscape Architects and an honorary corresponding member of the Royal Institute of British Architects.

Not only on account of his great devotion to the interests of the American Institute of Architects, but also because of his untiring work on behalf of the preservation and furtherance of the L'Enfant plan of Washington will Mr. Medary be remembered. In recognition of his untiring labor on behalf of the development of the architectural requirements of the national government in Washington, and on account of his high standing as an architect and as a man, endowed with an unusual simplicity of manner, kindliness of personality, generosity of heart and high integrity of character, Milton Bennett Medary was awarded, in April, 1929, the Gold Medal of the American Institute of Architects. This event, which occurred only four short months ago, marked the culmination of a great career. Little did his friends realize that evening in the Corcoran Gallery of Art, when, after the glowing tribute by James Monroe Hewlett, Mr. Medary received from the hand of Secretary Mellon the highest honor which the American Institute of Architects has in its power to present, that this dearly loved, much admired and greatly honored man would so soon be taken from them. It was his good fortune to have lived a splendid life, full of devotion to his chosen profession.



POWER HOUSE, MUSCLE SHOALS, ALA.

EWING & CHAPPELL, ARCHITECTS

From an Oil Sketch by Chesley Bonestell

THE
ARCHITECTURAL
FORUM

VOLUME LI NUMBER THREE

SEPTEMBER 1929

PLANNING OF INDUSTRIAL BUILDINGS

BY
MORITZ KAHN
ALBERT KAHN, INC., ARCHITECTS AND ENGINEERS

IN this age of intensive production, when manufacturers will spare no reasonable expense in the purchase of effective equipment, it is surprising to find so many factory buildings which are improperly designed for economical production. Very often a poorly planned industrial building is the result of a lack of knowledge of the basic principles which govern the design of this type of structure.

The day has passed when a manufacturer can be satisfied with any kind of a building which is constructed merely for the purpose of keeping out the elements; a building poorly lighted and ventilated, with an improper system of heating, with wrong floor heights and column spacings; a building with a jumbled arrangement of entrances, stairs, elevators and internal departments, and with the many objectionable features which result in its being as depressing as it is impractical for production purposes. The enterprising manufacturer of today demands an effectively planned factory building, even as he requires an efficient installation of equipment. Some architects still feel that a snappy looking, symmetrical plan can always be made to fit the functions of a factory building, and that a Beaux-Arts elevation is all-sufficient for a successful scheme, losing sight of the fact that the sole purpose of a factory building is efficiency and economy of production so that the greatest possible yield is returned on the capital outlay.

There is no intention of conveying the impression that a factory building should be devoid of all decorative treatment, and that appearances are of little consequence in so prosaic a place as a factory. There is no reason why these buildings should be ugly. Treated with architectural skill all of them can at least be presentable, and often they can be made extremely imposing. If it can be obtained at little or no extra expense, and it can be, a pleasing elevation to a factory is worth having,—not only for its advertising value to the manufacturer, but also for the effect it has on employes. One of the most important things about an employe is his mental attitude toward his work, and one method of improving this attitude (not the only method, it is true, but nevertheless powerful) is to make his environment agreeable. But the designer of the factory building should continually bear in mind that every manufacturer is interested in dollars and cents first of all, and in appearances only secondly. A good appearance can be obtained without extra expense by the proper use of materials, by the general contour or shape of the building, by the accentuation of structural lines, by the proper proportioning of solids and voids or the massing of the structure. This form of decorative treatment does not increase the cost of the building, whereas an attempt to make an indifferent building presentable by applying ornament with a lavish hand is bound to prove a failure.

Probably the first important point to emphasize in the design of an industrial building is the need of planning it in coöperation with the manufacturer in order that the building may be designed for the specific purpose to which it is to be put. The character of the product and the processes of its manufacture must govern the design and type of the building to be used. Obviously, the manufacture of different kinds of products can be effectively carried on only in different types of buildings, each suited for the particular product to be manufactured. For example, the requirements in the manufacture of food products differ from those of a shoe factory; a motor assembly building will differ from a body construction building; a spring and upset building will differ from a steel rolling mill; and a foundry will be entirely different from a forge shop. While it is possible to manufacture food products and shoes in the same type of building, or to assemble cars

Engineering Laboratory, Ford Motor Company, Dearborn, Mich.
Albert Kahn, Inc., Architects and Engineers

and build bodies in the same type of structure, the adjustment of methods of manufacture to the particular type of building one happens to possess does not tend toward economical production. In other words, the method of production should not be adjusted to the building, but the building should be adapted to the production.

There are some general principles of industrial architecture which apply to all types of factories. To enumerate a few of them, the line of production should be continuous and direct; departments should be so located that material in course of production travels the shortest possible distance; there should be no crossing or confliction in the lines of travel which would result in congestion; departments should be so located that they can easily be re-located or expanded as any change in the manufacturing process or any growth in the industry may require; entrances, stairs and elevators should be located where they will afford the best means of access and where they will least interfere with the process layout; there should be an abundance of natural lighting and good ventilation; internal columns should be as few as possible compatible with economy of construction and should be so located as to permit the placing of equipment, causing the least interference with the flow of production; and floor heights should be adapted to the nature of the product and the methods of its manufacture.

Photos. Thomas Ellison

Forge Shop, Chevrolet Motor Company, Detroit
Albert Kahn, Inc., Architects and Engineers

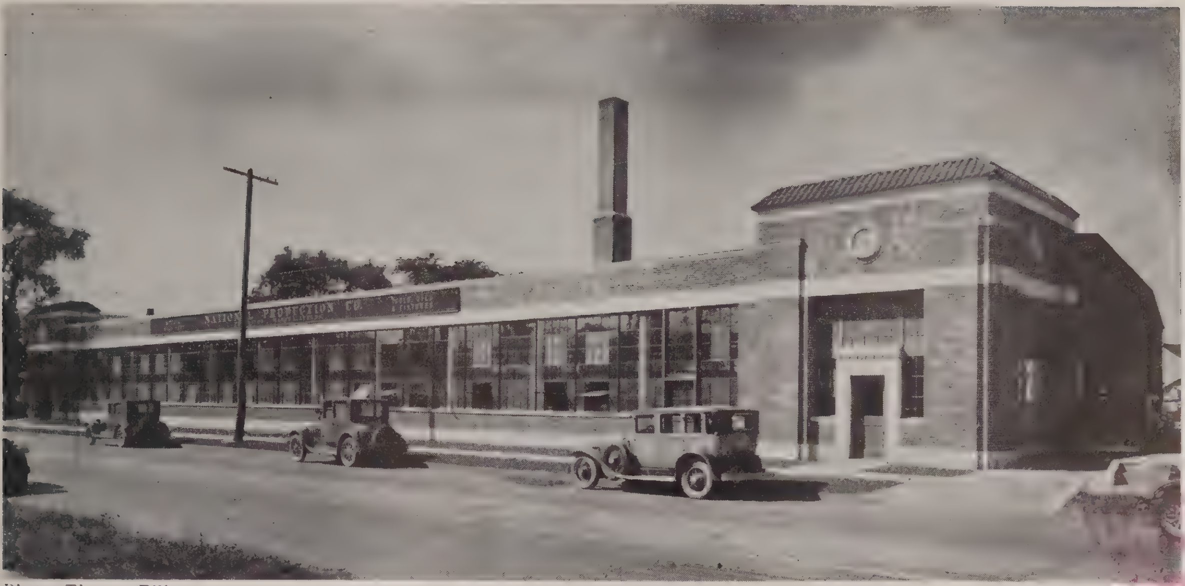


Photo. Thomas Ellison

Plant for National Production Company, Detroit
Albert Kahn, Inc., Architects and Engineers

A well designed factory building will have a simplified plan,—in truth, the simpler the better. An intricate, though symmetrically balanced arrangement of departments, an interesting appearing plan might look well on paper from the architect's standpoint, but it will prove impractical from the works manager's point of view. The works manager must be unhampered in the arrangement of the departments and his equipment. For general manufacturing purposes it will suit him better to give him a clear open space which will permit him to arrange his departments as he thinks best, to re-arrange them whenever he finds it necessary on account of changes in methods of production, and to expand them in all directions when the growth of the industry requires. A proper plan of the main building will permit of horizontal expansion in any direction at any future time, and in the case of a multistory building the foundations and columns can be designed strong enough to support future additional floors, thus allowing for upper expansion as may be necessary. In the general arrangement of a plant care should be exercised in the location of railroad sidings, driveways, power houses and auxiliary buildings, so as not to interfere with any future expansion.

For general manufacturing purposes, a standardized plan of building will prove to be of advantage. This refers particularly to such build-

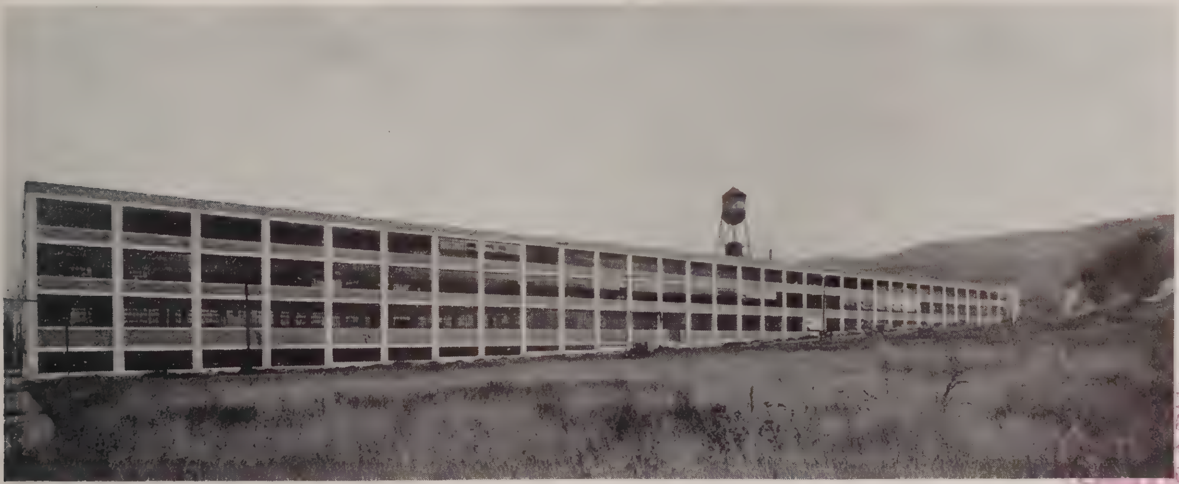
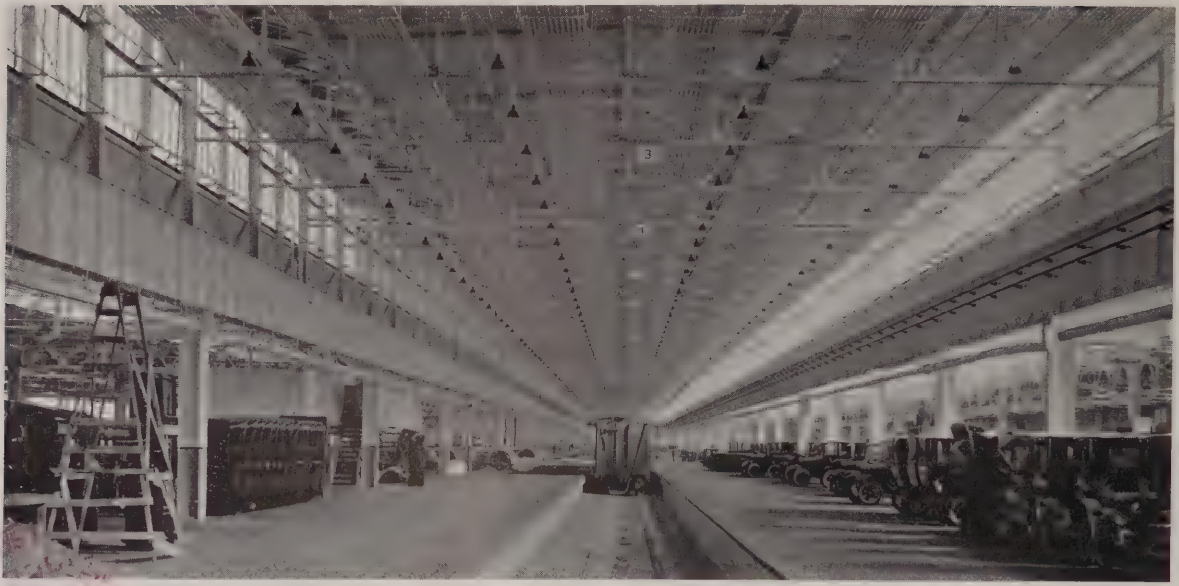


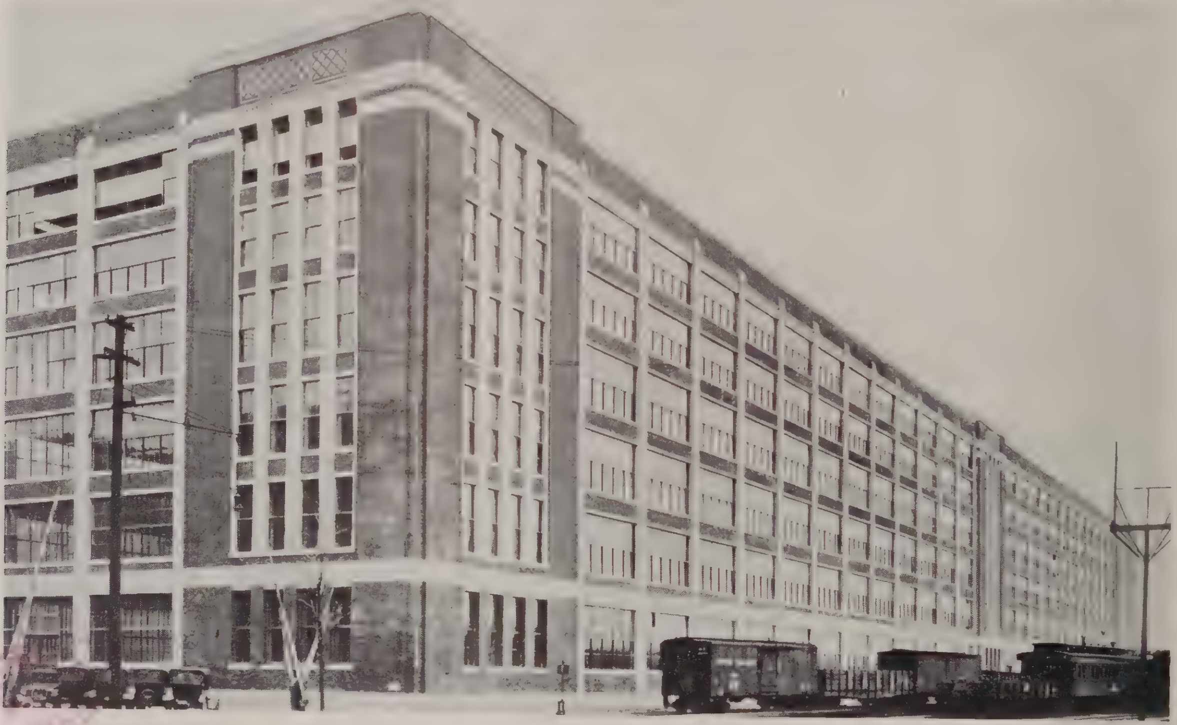
Photo. Western Photo. Co.

Assembly Plant, Chevrolet Motor Company, Detroit
Albert Kahn, Inc., Architects and Engineers



Interior, Assembly Plant, Ford Motor Company, St. Paul
Albert Kahn, Inc., Architects and Engineers

ings as are used for motor assembly plants, or for the manufacture of bodies, motor parts, machine tools, food products, shoes, clothing and the like. In this type of factory the architect need only familiarize himself with the general method of manufacture, and the building need not be designed for any particular installation of equipment. There are other types of factory buildings, however, such as foundries, forge shops, cement plants, coal distillation plants, glass plants and the like which must be designed to fit particular schemes of equipment installation. In the first mentioned group of factories the building can be planned around the process of manufacture; in the second group the building must be designed around the equipment layout.



Body Building, Studebaker Corporation, South Bend, Ind.
Albert Kahn, Inc., Architects and Engineers

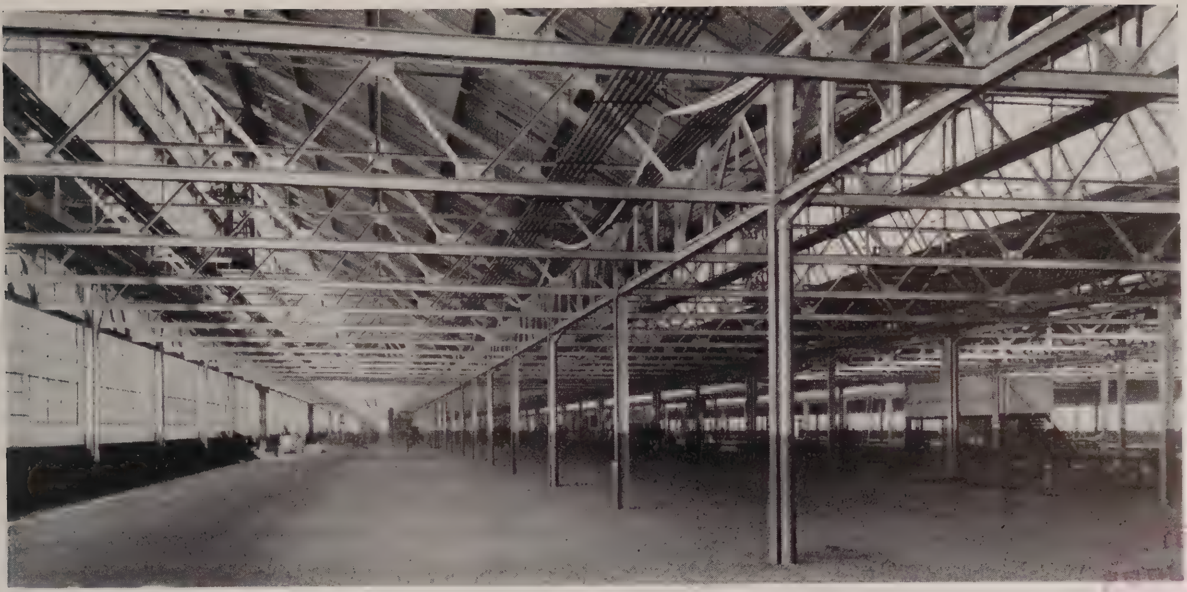
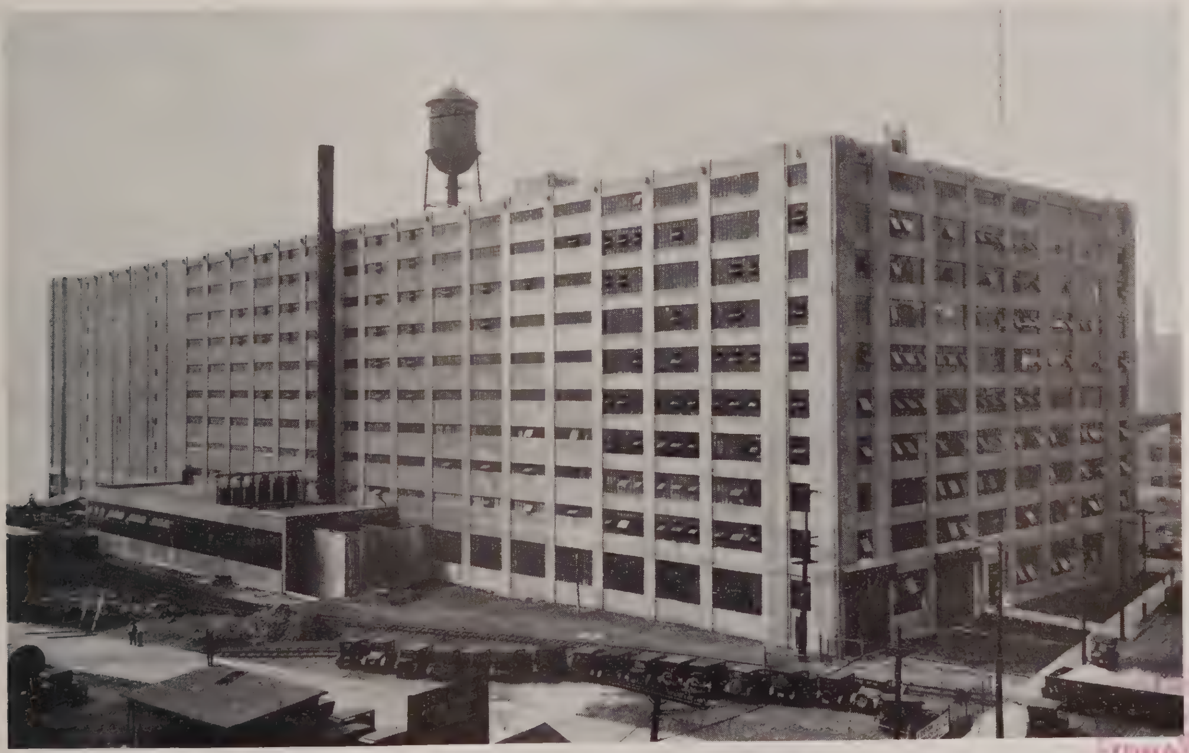


Photo. Thomas Ellison

Interior, Assembly Shop, Dodge Brothers, Inc., Detroit
Albert Kahn, Inc., Architects and Engineers

Before any building of the latter group can be designed, the architect must be in possession of the final equipment layout to make certain that the construction according to his plans will not interfere with the installation of the equipment.

It is difficult in an article of this length to dwell extensively on the structural features of industrial buildings, but here are some principles which should be observed by the designer of the factory. As previously intimated, there should be an abundance of natural lighting and ventilation. Windows should be as expansive as possible with an ample supply of opening ventilators. Daylight and fresh air cost nothing and consequently should be used to the greatest extent. The window or glass area should not be less



Warehouse, Detroit Railway & Harbor Terminals Company, Detroit
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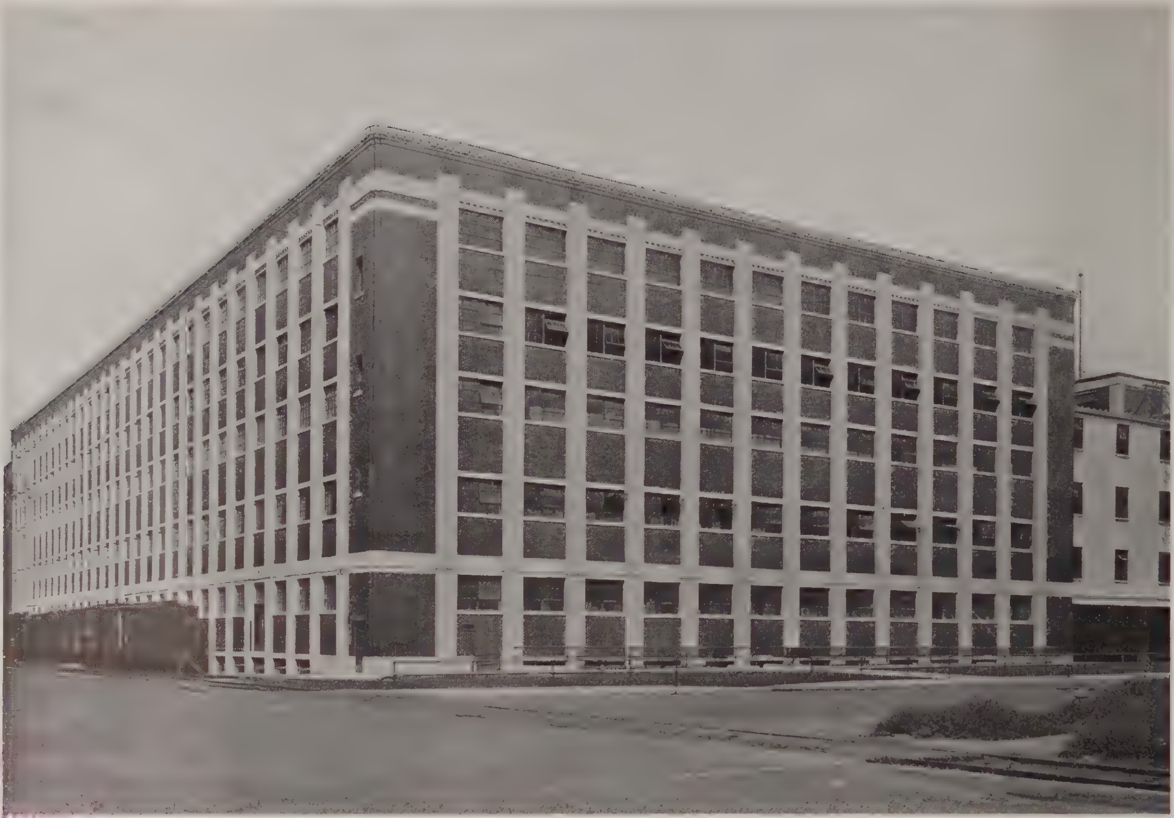

Warehouse, Mishawaka Woolen Mills Company, Mishawaka, Ind.
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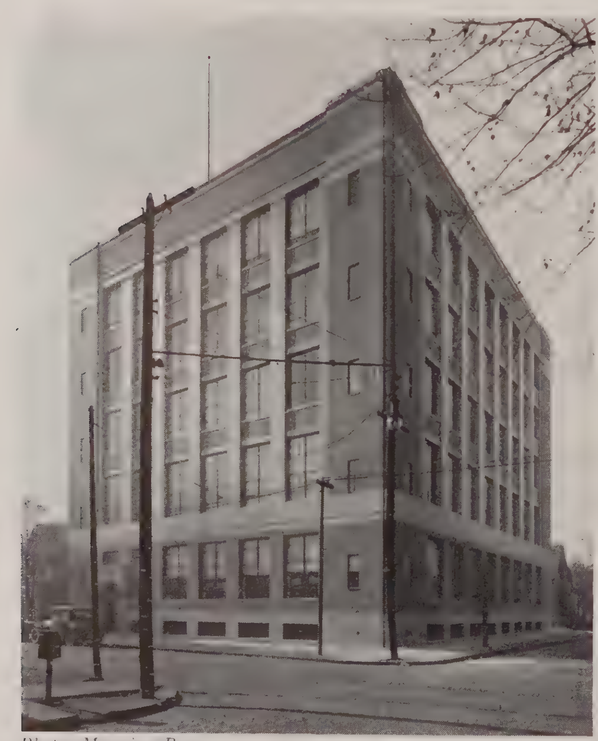


Photo. Manning Bros.

Factory for Mazer-Cressman Cigar Company, Detroit
Albert Kahn, Inc., Architects and Engineers

than 22¼ per cent of the floor area in the case of a multi-story building, and it may run as high as 30 per cent of the floor area in the case of a single-story building. Opening ventilators in side wall sash should not be less than 35 per cent of the total sash area and in monitors not less than 50 per cent of the sash area. The monitors affording roof lighting for single-story buildings should be so spaced as to give the greatest uniformity rather than intensity of lighting. Irregularity of lighting proves detrimental to the worker. The form or shape of the roof construction should be such as to promote natural ventilation which can be made to be as effective as, and always more economical than, forced.

No definite rules can be laid down for the spacing of columns, nor for story heights in the case of multi-story buildings. These conditions are governed by the nature of the product. For example, in the case of a multi-story building used for the manufacture of motor bodies, a clear distance of 22 feet between columns is most suitable, as this allows for two lines of conveyor tracks with just sufficient gangway for the workers. Again, in the case of a single-story building, say for a stove plant, columns spaced 35 feet center to center will prove most effective

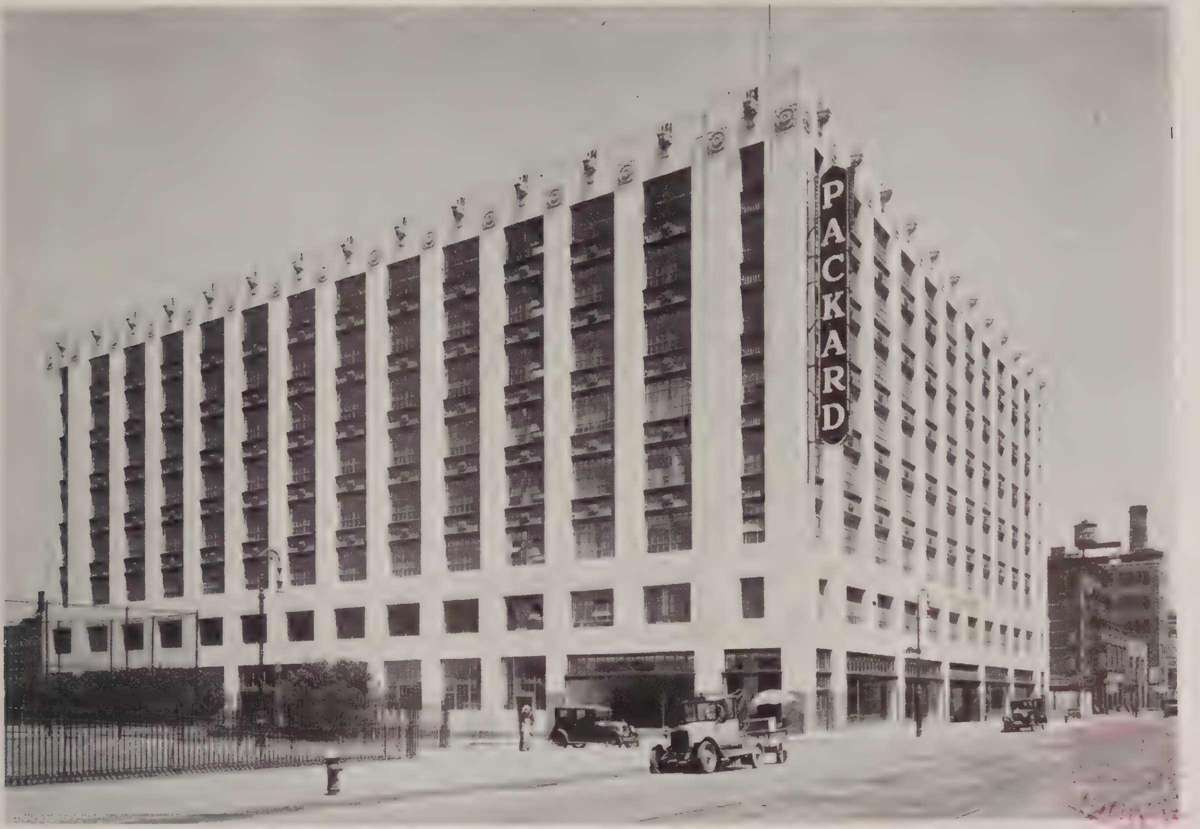


Photo. Tebbs & Knell, Inc.

Packard Motor Car Service Building, New York
Albert Kahn, Inc., and Frank S. Parker, Associated, Architects

for economy of construction and working floor space. In general, however, it can be assumed that column spacing for multi-story buildings should fall between 20 and 30 feet center to center, and column spacing for single-story buildings should fall in the range of from 25 feet to 40 feet center to center.

It is likewise difficult to fix story heights of floors in case of multi-story buildings, because this also depends upon circumstances. For the average multi-story factory building a clear story height of 12 feet, 6 inches will prove practical for buildings of up to 100 feet in width, having unobstructed views on both sides to admit daylight. Single-story buildings, in general, should have a clear height of 14 feet to the under side of the roof trusses. This dimension, of course, does not take into consideration clearances for overhead cranes or conveyors which will require special treatment.

The disposition of entrances for stairways should be such as to afford the shortest and best means of access to the working spaces. Locker rooms and toilet rooms in expansive plants should not be concentrated in a few large units, but should be divided into many small units located around the plant so that the distances between

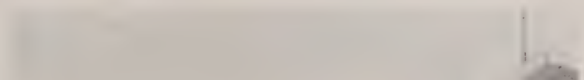


Photo. Manning Bros.

West End Plant, Fisher Body Corporation, Detroit
Albert Kahn, Inc., Architects and Engineers

them are not too great and to avoid excessive loss of time in their use by employes. In a single-story building, spread over a large area, toilet and locker rooms can, with advantage, be located on elevated platforms in the spaces between the roof trusses. This will save floor space and will eliminate interference with production, because the floor underneath can be used for production purposes, tool cribs, wash rooms, etc.

The floor finish of the factory building should be of a kind which is best suited for the particular department in which it is to be used. Where there is no excessive trucking in the transport of the product, or where conveyors are used for this purpose, the ordinary cement finish properly treated and hardened will prove adequate. In some departments, however, a cement finish is not suitable. For instance, in a tool room a wood floor will prove more satisfactory, because of the danger of injuring a tool dropped on a hard surface. In departments or gangways subject to certain types of trucking, a wood floor, either maple or wood block, may be necessary, because the trucking will dust up the surface of an ordinary concrete floor with consequent injury to the bearings of machinery; and, furthermore, the repair of a concrete floor necessitated by the wear of trucking is more difficult than the repair of wood flooring.

Factory buildings, whenever possible, should be constructed of fireproof materials. In the case of a fire, the loss of or injury to the building can be covered by fire insurance, it is true; but the loss due to disorganization or stoppage of output cannot be covered by insurance, and this is often of more importance than the monetary loss involved in the destruction of a building and its contents. Structural steel framing with brick walls and cement tile roofs will prove suitable for single-story buildings. In the case of multi-story factory buildings, reinforced concrete framework with brick enclosing walls will result in economy and will make possible expeditious construction, because the reinforced concrete work can usually be carried out in less time than is required in the preparation of shop drawings for and the fabrication of structural steel.

In such buildings where the use of elevators is necessary, the elevators should be spaced throughout the plant where they will prove of most efficiency and where they will not interfere with the flow of material in course of manufacture. Elevator platforms should be as large as possible, and high speed elevators should be used as extensively as possible. In factory buildings, where elevators are used, the elevators very often prove the "bottle neck," so to speak, of production. The best and speediest of elevators are never too good; any stoppage of elevator service means a stoppage of production, and while on this subject, a word could be said of elevator doors. The use of the best of doors, regardless of cost, is always advisable. As previously said, the manufacturer is always concerned regarding the cost of his building, which he naturally wishes to obtain at the lowest possible price. While factory buildings should be constructed as economically as possible, the economies should result from close study of structural details and the best use of structural materials. The designer should not attempt to produce economies by using cheap elevators and cheap elevator doors. No manufacturer will be thankful to a designer who saves a few thousand dollars on an elevator installation which is continually causing stoppage of output, and consequent continual money loss.

In conclusion it is well to call attention to the fact that an architect who specializes in the design of industrial buildings is not expected to be an expert in process layout. The works manager is best capable of preparing his own process diagram. Being in possession of such a diagram, the architect should confine his efforts to building around that layout a factory which is best suited to the scheme of operation. The specialist designer need possess merely a general knowledge of the principles of manufacture. He should, however, be fairly well acquainted with the nature and possibilities of mechanical equipment, and of the requirements of power and shafting; he should be conversant with floor heights as governed by various processes of manufacture; he should be able to design efficient heating, ventilating and artificial lighting installations and, above all, he should be able to advise upon the most suitable type of structure required for the manufacture of a specific product. It would be expecting too much of any designer to be master of all the principles that enter into the design of industrial buildings, and therefore the architect who wishes to specialize in this field of work is well advised in surrounding himself with a staff of assistants, each of whom will be especially qualified in his particular sphere. With such a staff under his direction and management, the architect will prove of great value to the manufacturer.

So rapidly have the industries of this country grown and developed in the past 70 years that there has been little time or opportunity for the work of the trained architect in the designing of such buildings. Today it is a matter of pride among the industries, great and small, to erect buildings planned for the most efficient installation of machinery and equipment and to design them along carefully studied architectural lines.

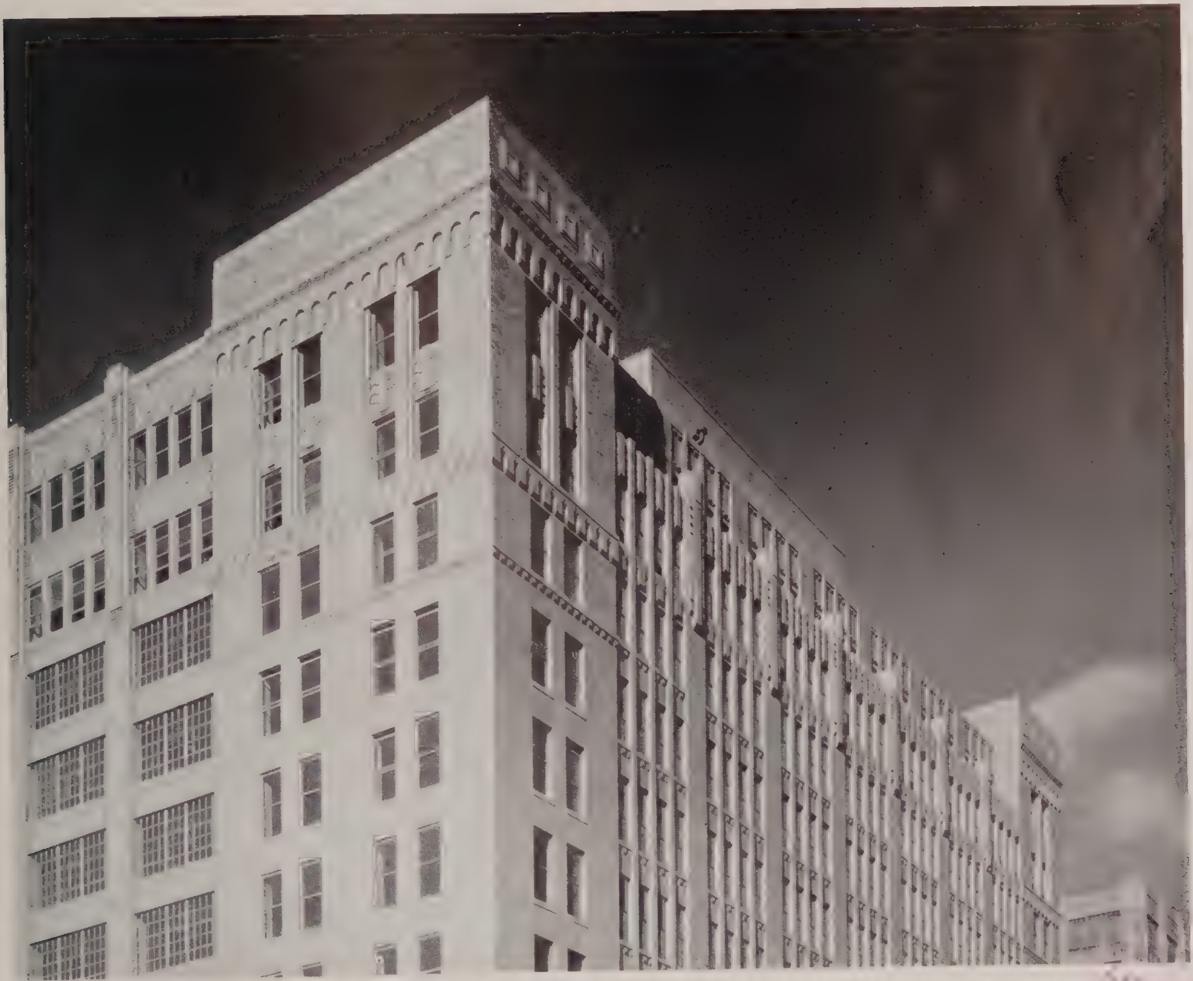
THE ARCHITECTURE OF INDUSTRIAL BUILDINGS

BY

ELY JACQUES KAHN

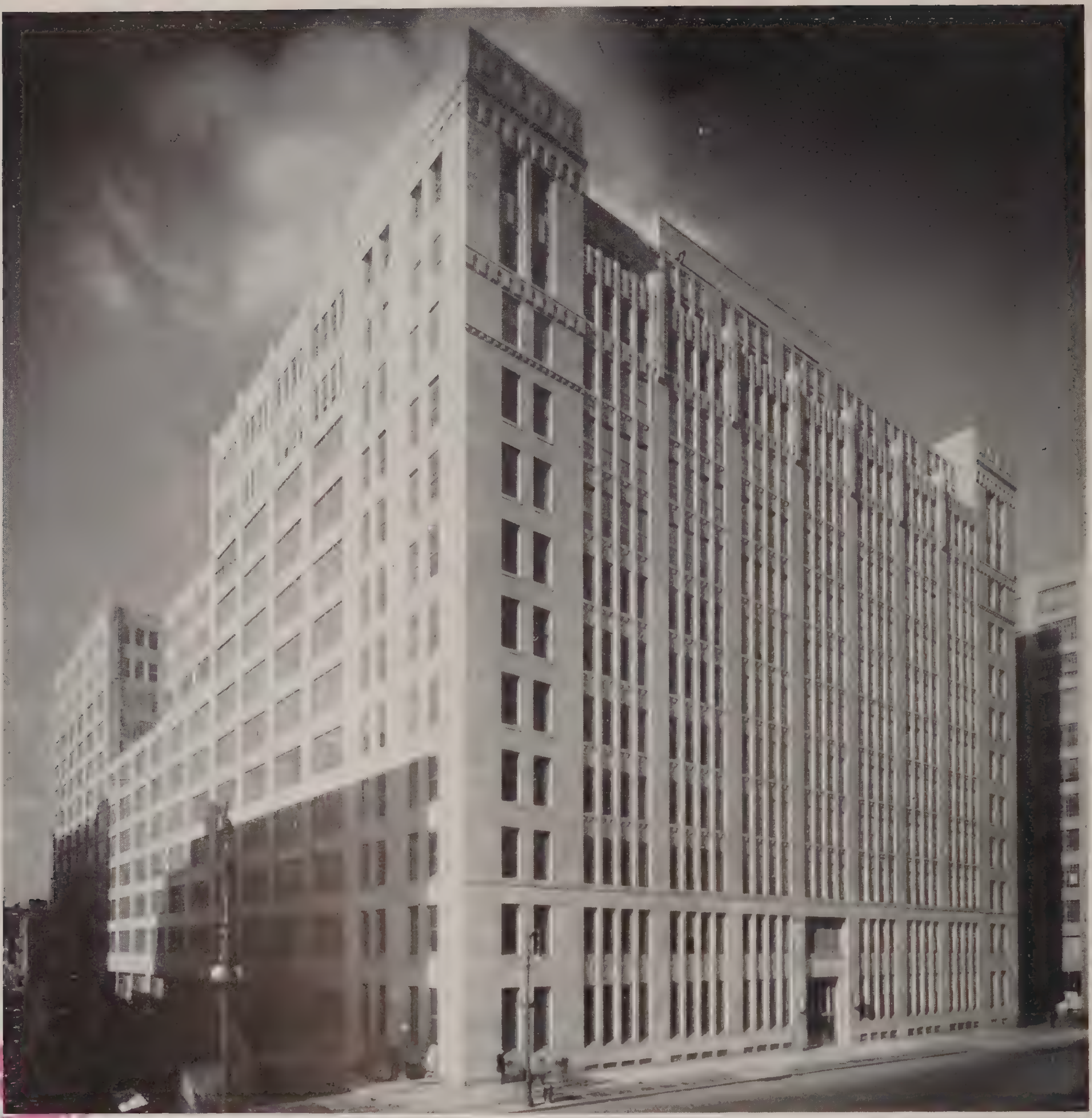
PREACHING the doctrine of modernism has its entertaining reactions. A man believes that he himself sees the light and discovers that the beam he has noticed is merely a reflection of the illumination all about him. The moment has acknowledged the existence of a point of view entirely at variance with that of a generation past, and in the architecture of the industrial building in particular, the result is sweeping. Where domestic work resists, grimly, the elimination of faked "quaintness," and where likewise the monumental building disdainfully avoids variation from precedent, the industrial structure sails merrily into experiment. Here common sense,—the engineering instinct, cost, income,—predominates. Beauty comes as a result of the solution of a problem where use of extraneous material or mere picturesqueness would be absurd.

It is evident that the new design of this type of structure dates from the first use of steel or reinforced lintels where large glass areas were possible. The curious factory structures with heavy brick walls and small windows,—if they still exist,—are merely awaiting the pickaxe of tomorrow's demolition. Light and ventilation are paramount. The engineer smiles and suggests that the more modern conception would be that of purely scientific illumination by electricity; uniform distribution of the color and intensity of light required; ventilation to be effected by change of air at required intervals; the air itself to be regulated in moisture and temperature. Interesting theory, and very often essential in spite of the presence of windows



Photos. Tebbs & Knell, Inc.

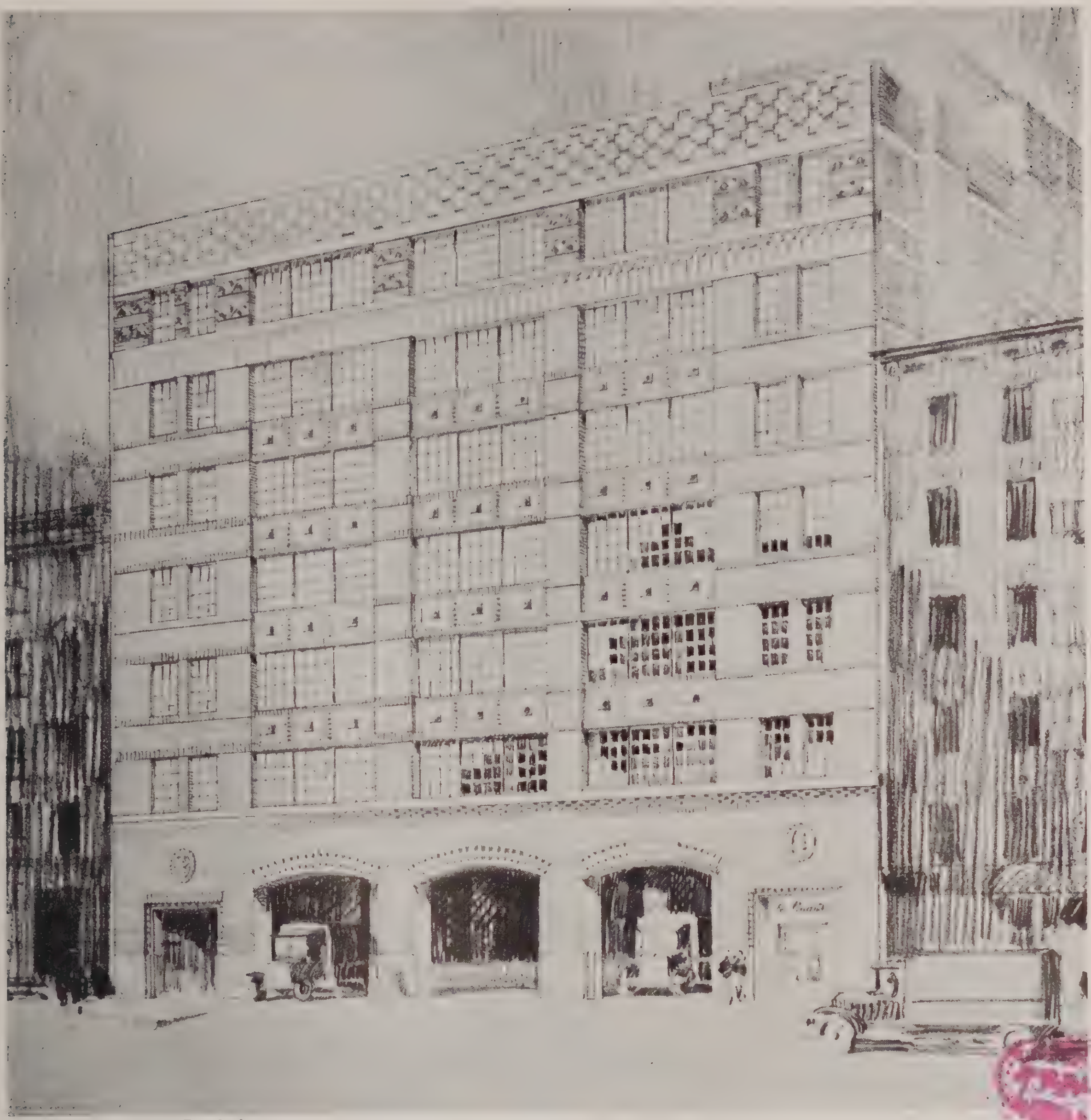
U. S. Appraisers' Stores, New York
Buchman & Kahn, Architects



U. S. Appraisers' Stores, New York
Buchman & Kahn, Architects

which, though in some instances they may be of major importance, in others are permitted purely on sentimental allowance to the traditional instincts of employes who object to being shut off from a glimpse of what is occurring outside.

The industrial building is primarily and definitely a machine for the production of a commodity. The solutions to its problem can vary in material or detail, but, basically, the structure must answer its purpose. The column arrangement must properly fit the lines of machines, the receptacles for merchandise, the handling of goods for packing or shipping. There are, quite obviously, varying types of industrial structures that include the very tall factory buildings of New York, as well as the one-story, roof-lighted shed type of mill that is found outside of the cities and on cheaper land. The tall buildings of the Garment Center in New York, the printing buildings developing in the Varick Street section and likewise in the forties east of Lexington Avenue, represent a characteristically large city type of factory. In New York, in particular, this type of structure has had intense development. Through real estate sales pressure, to a large extent, manufacturers have been brought together. The clothing trades, the silk, wool, leather, toy and furniture industries concentrate in definite districts where it is apparently convenient for the buyer to find



From the Architects' Rendering

Pinaud Building, New York
Buchman & Kahn, Architects

his market and where the subsidiary businesses likewise cluster to avoid unnecessary loss of time in transacting their affairs. With this most persistent grouping there has come the problem of freight traffic,—the actual handling of the enormous quantities of goods of every nature. The clothing district in New York, for example, in turn attracts the various supply houses that handle fabrics,—silk, cotton, wool and rayon.

As the manufacturers find it difficult to conduct production on a large scale in locations where rents are relatively high and shipping conditions unfavorable, many of the large buildings develop into sales offices, finished stock rooms and executive offices, with the actual producing plants outside of the city or in sections of the New York area that are more adaptable. In the very tall New York factory structure, the standard of height has increased in the last ten years in a steadily rising scale. Where 16 floors was normal in 1920, 18 and 20 appeared later, until in this year monsters of 30 and more are commonplace. The results, considering the restrictions of zoning conditions for relatively small lots, develop large units of ground area and improved elevator and freight facilities.

The street traffic situation is one of the factors which will seriously endanger the steady growth of such districts. There is no question but that the manufacturer will presently object to the inconvenience of losing valuable time by the most absurd street congestion. The building can be as well planned as may be possible with modern facilities of every conceivable type, and yet if the moment the merchandise comes to the street traffic is stopped, the building cannot be successful. The difficulty naturally has to do with an entirely unreasonable city plan,—narrow streets, intense through and cross circulation, and no direct arteries. The solution is yet to be found, though freight tunnels, secondary streets, may be less visionary when the actual demand insists on finding them.

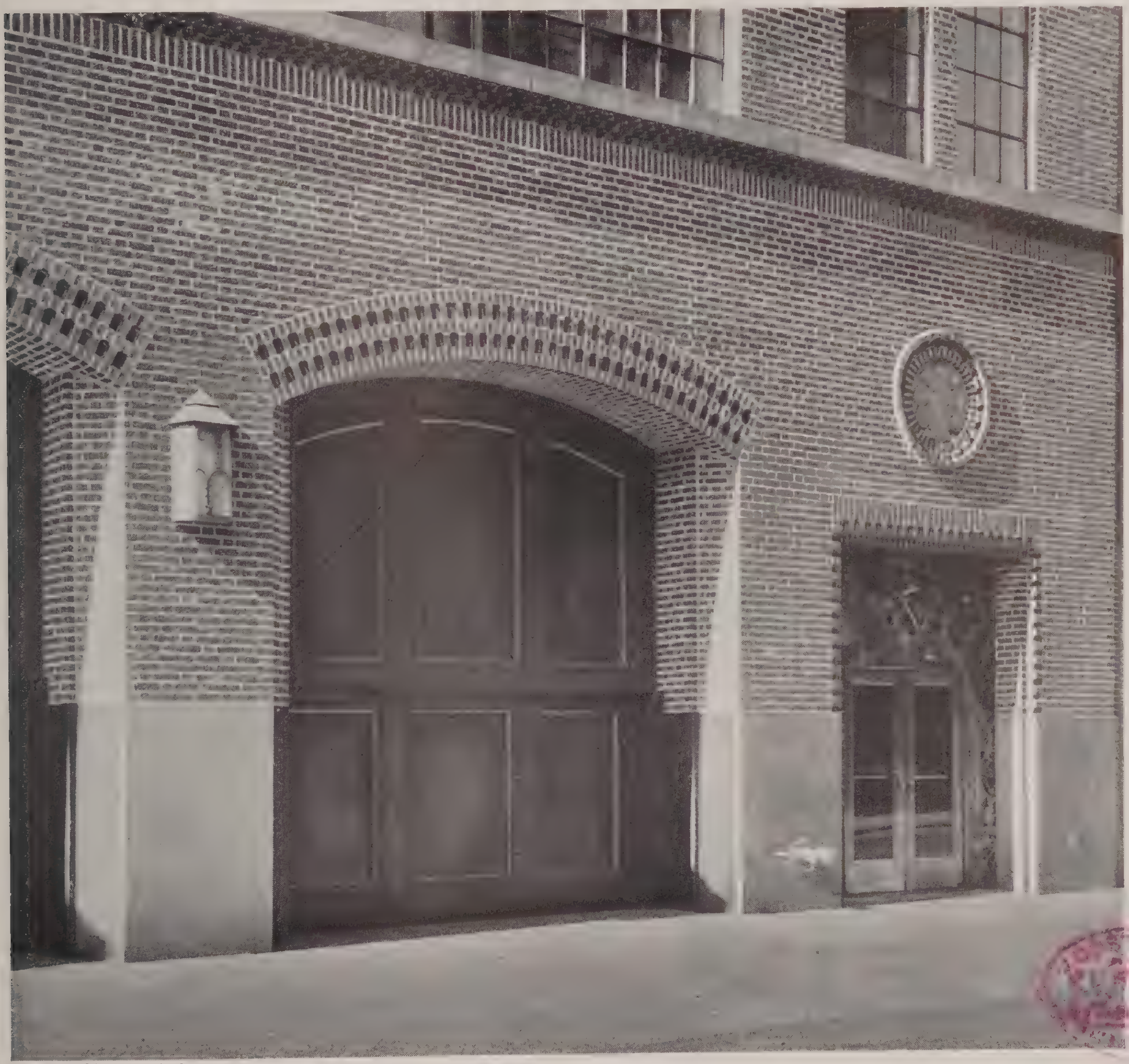
The large buildings are highly specialized in equipment. The elevators and freight halls are designed to accommodate particular industries. Furniture, for example, requires large elevator cars in which bulky pieces can speedily be transferred; the floor loads are light. Millinery buildings require column arrangements adaptable to a number of small machines,—live steam for essential steps of manufacture; high ceilings for freight corridors because of the bulk of the cardboard boxes in which finished product is shipped. In other buildings the finished articles are handled mainly in express package form, so that provision must be made for express collecting and checking, independently of the constant entry of bulky raw material. In the design of these great units, low cost is naturally of major importance. Economy of plan and avoidance of areas that are poorly adapted to the uses intended, are paramount. Windows have to be arranged to provide sufficient light; the mechanical requirements as to live steam, electric power, ventilating shafts, package chutes are of importance. In the factory building, high or low, column spacing seems to be the most important consideration. When the bays become too large, excess cost of columns and steel framing appears. Normal ceiling heights would likewise be affected by inordinately deep girders. In printing buildings the variation in sizes between heavy newspaper presses and the smaller types for normal printing of books and commercial production of every sort, determines the necessary clearance requirements, in walls and floor loads. Vibration under the stress of heavy machinery must be avoided by adequate load capacity and proper reinforcing.

The industrial structures problem demands in the first instance an engineering solution. Areas conveniently disposed; adequate light; proper facilities for the transaction of the business in hand are necessary. There can be no modernity in design that does not begin with such principles, and through such logical steps and the elimination of unnecessary decorative features it is

Interior, U. S. Appraisers' Stores, New York
Buchman & Kahn, Architects

possible that something new may develop. In fact, it is obvious that this must be the case, for every day's problem demands a new solution, whether it be the question of an aëroplane factory, a hangar, or a building for the handling of some new product that requires specific space, height, illumination. The major difficulty of the designer of industrial structures is that he is still conscious of the existence of an æsthetic problem. The untrained person, when he finishes what he considers a satisfactory solution of his practical problem, adds curious inserts of tile, bits of carving, or a mongrel door to satisfy some yearning for decoration. The fact that fine proportion, balance of mass, and agreeable color of material are more important, fails him.

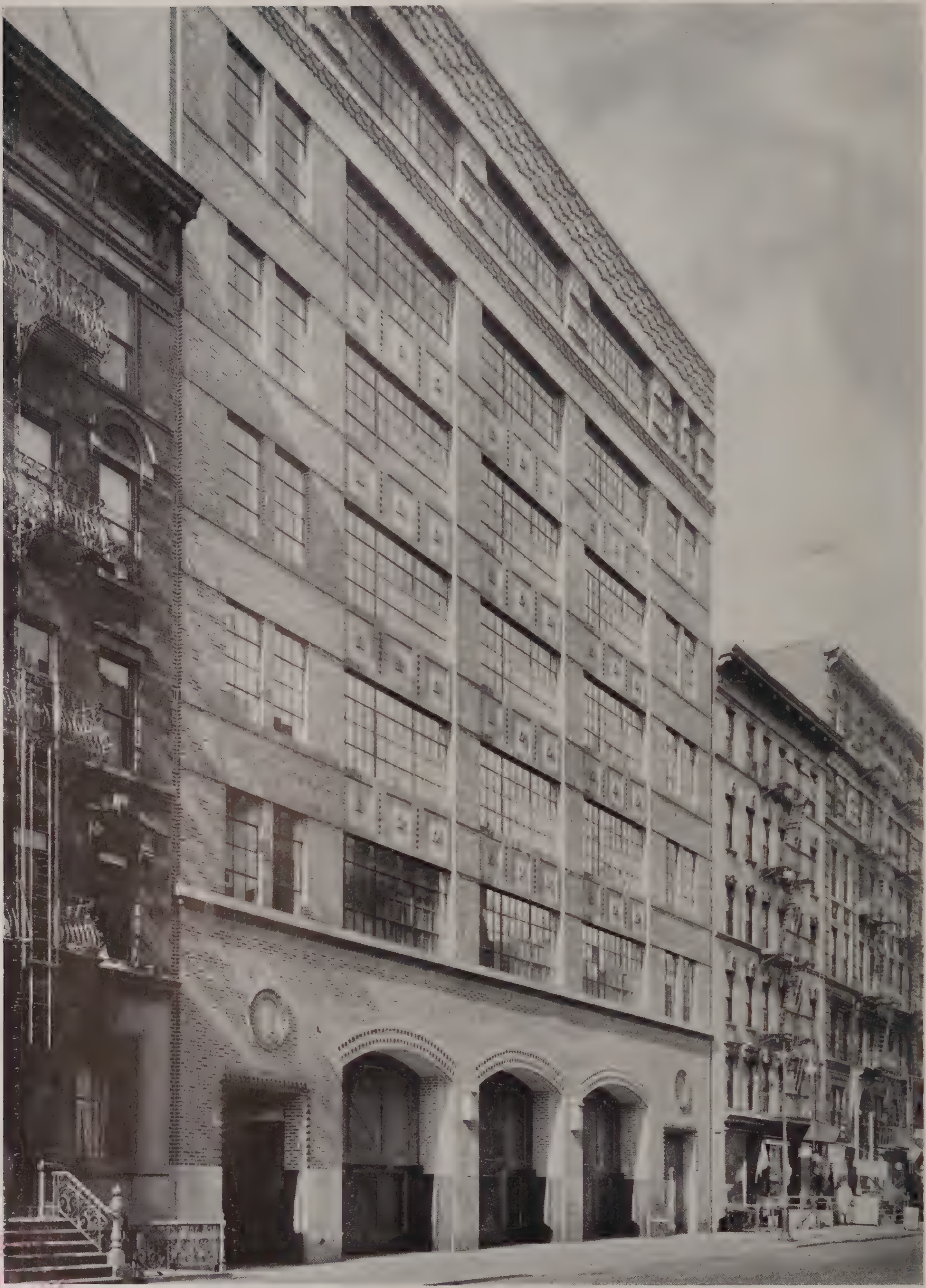
The great hangar at Orlay is a splendid piece of design that needs no ornament to improve it. The great factory buildings of Peter Behrens in Berlin and the buildings at Dessau are equally vigorous and require no apologies for being of this day. The successful industrial establishment exists primarily and lastly to serve a functional purpose. If it succeeds in that it is almost obvious that it will be agreeable to look at for the same reason that the machine itself is attractive,—there is nothing extraneous, and the proportions are normal to a working unit. It is only when the designer begins to inject æsthetics that the danger arises. There is no thought in this of minimizing the importance of the trained designer, but particularly the checking of the enthusiast who will distort a fine mechanism to simulate some classic monument or trifle with the simplicity and clarity of fine mass and proportion, which is almost always a failure.



Photos. Sigurd Fischer

Door Detail, Pinaud Building, New York

Buchman & Kahn, Architects



PINAUD BUILDING, NEW YORK
BUCHMAN & KAHN, ARCHITECTS

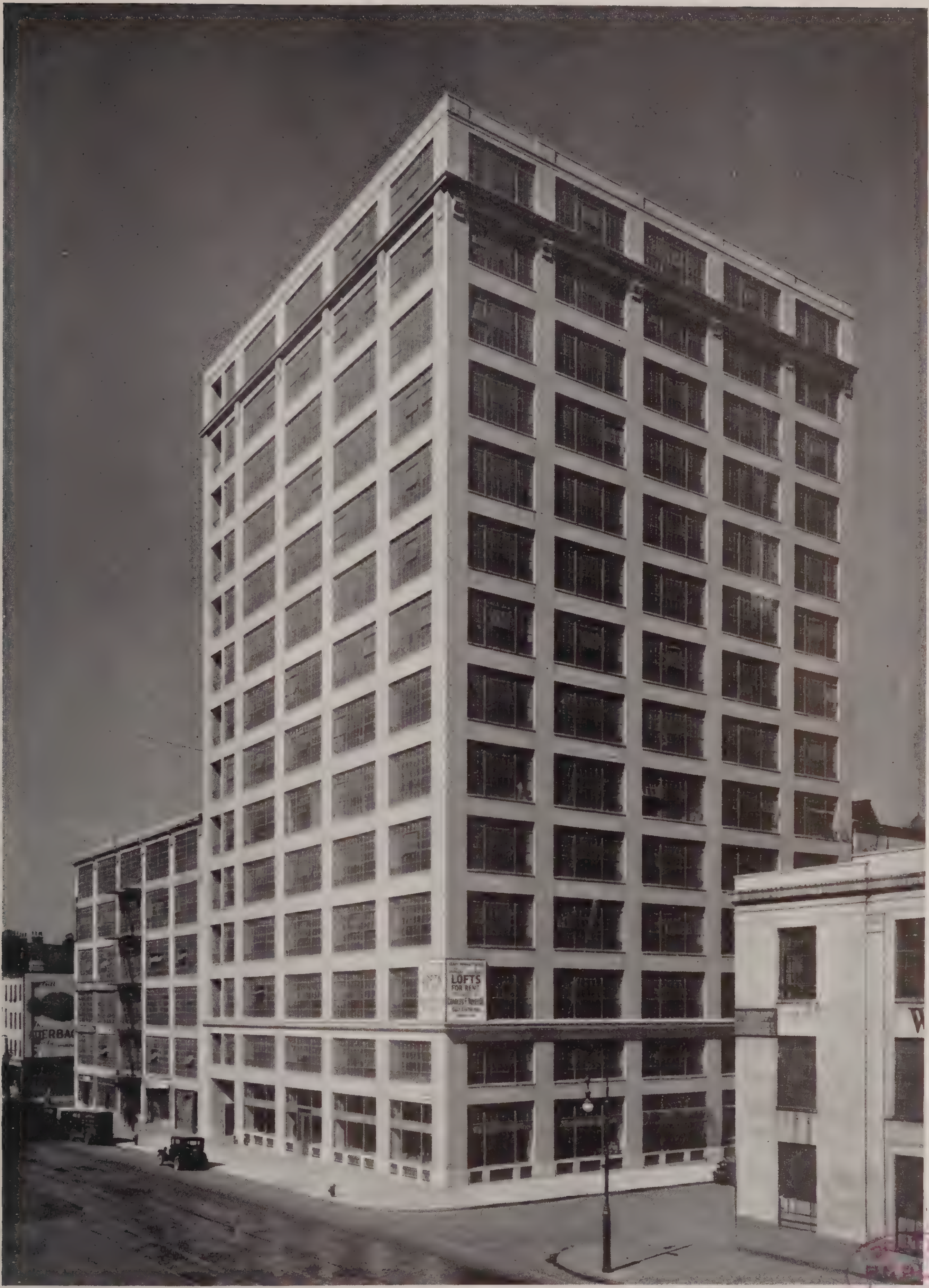
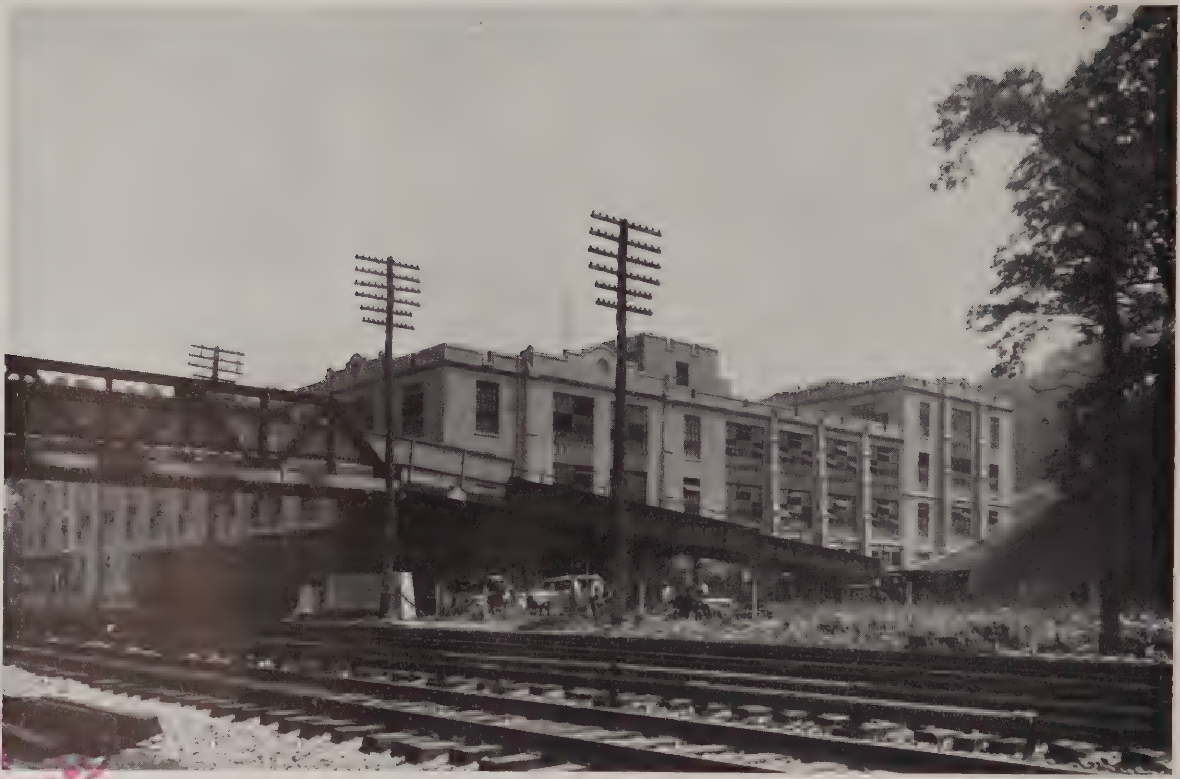
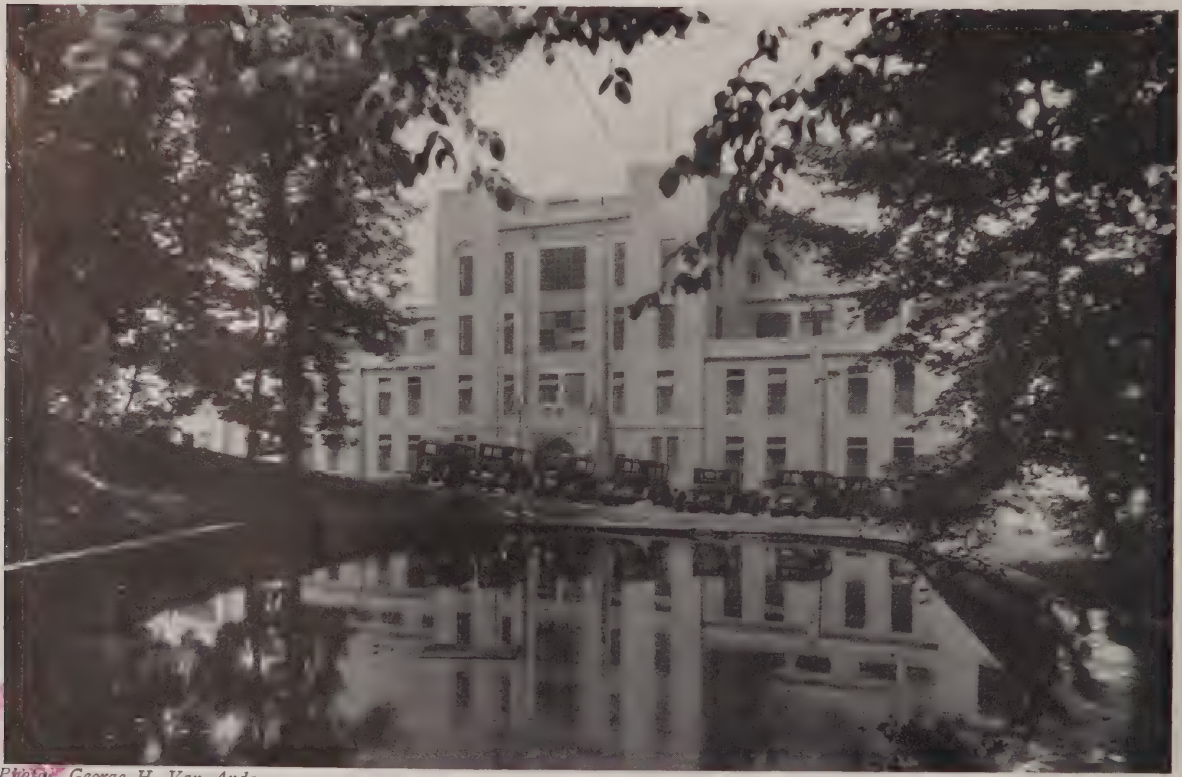


Photo. Tebbs & Knell

LOFT BUILDING, 639 ELEVENTH AVENUE, NEW YORK
ERNEST FLAGG, ARCHITECT

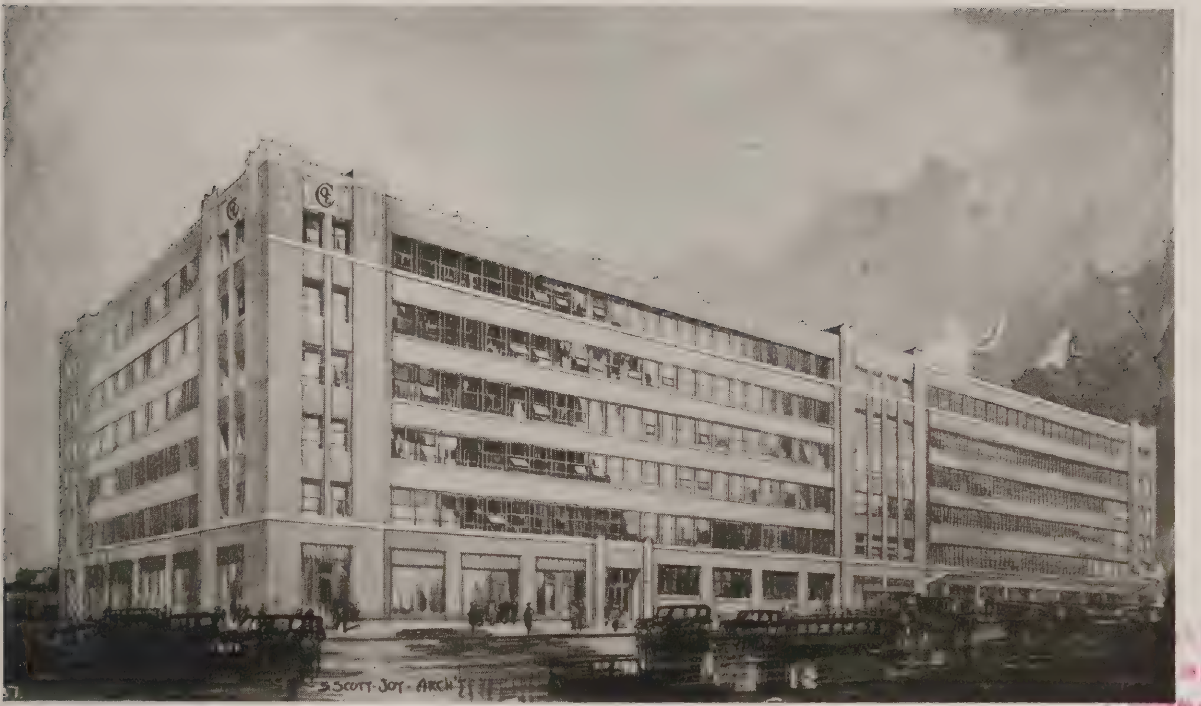
BOSTON PUBLIC LIBRARY





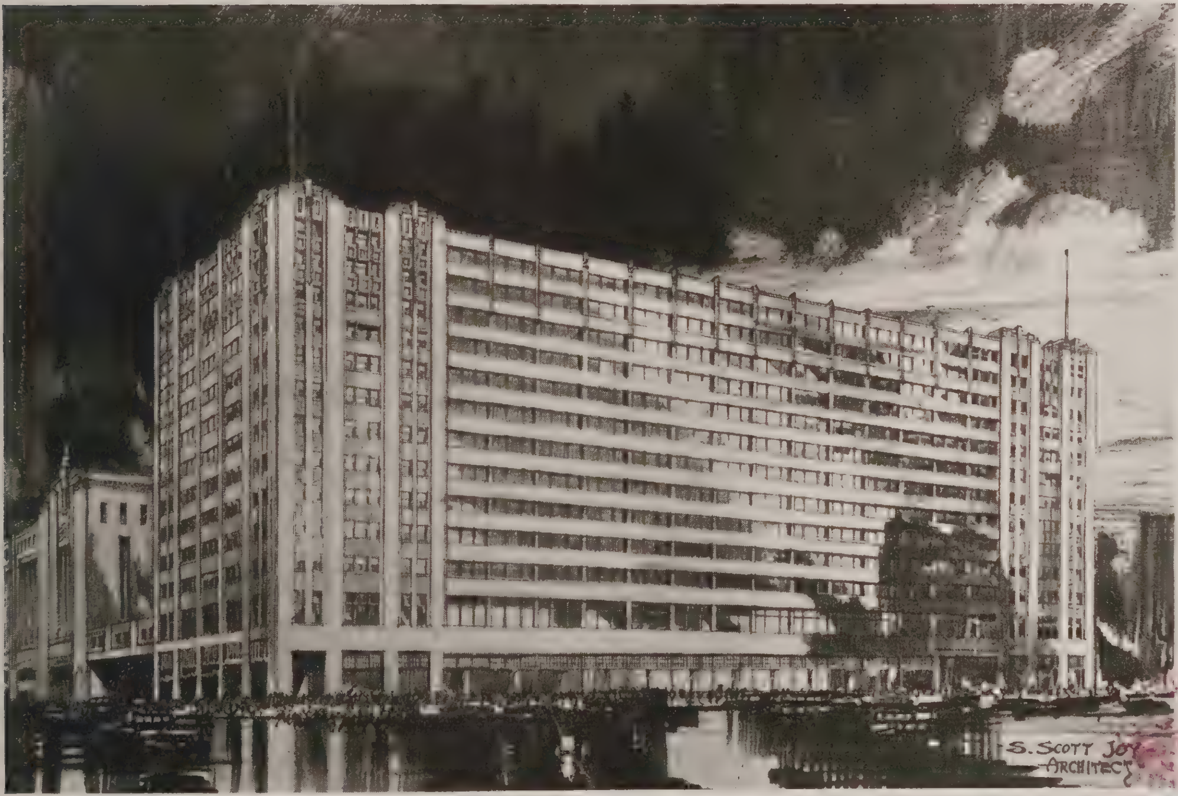
Photos: George H. Van Anda

BUILDING OF METHODIST BOOK CONCERN, DOBBS FERRY, N. Y.
VISSCHER & BURLEY, ARCHITECTS



Plan on Back

COE TERMINAL WAREHOUSE, DETROIT
S. SCOTT JOY, ARCHITECT

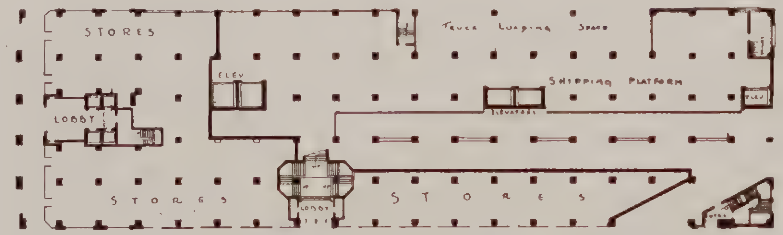


Plan on Back

NORTH STATION INDUSTRIAL BUILDING, BOSTON
S. SCOTT JOY, ARCHITECT

COST AND CONSTRUCTION DATA

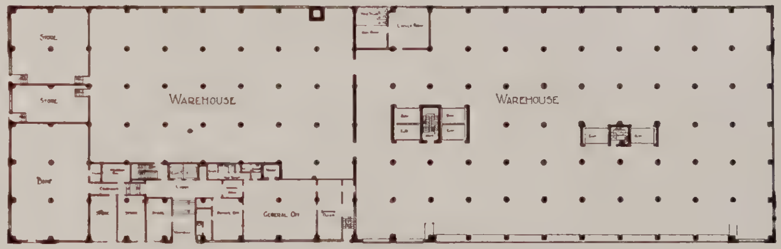
Year of Completion: 1929.
Type of Construction: Flat slab and some steel column cores.
Exterior Materials: Face brick, composite stone and concrete.
Floors: Cement.
Windows: Steel sash.
Heating: Steam metered from distant plant.
Cubic Foot Cost: 25 cents, exclusive of architect's fee.
Total Cost: $1,664,137, exclusive of architect's fee.
Use of Building: Heavy warehouse and loft building.



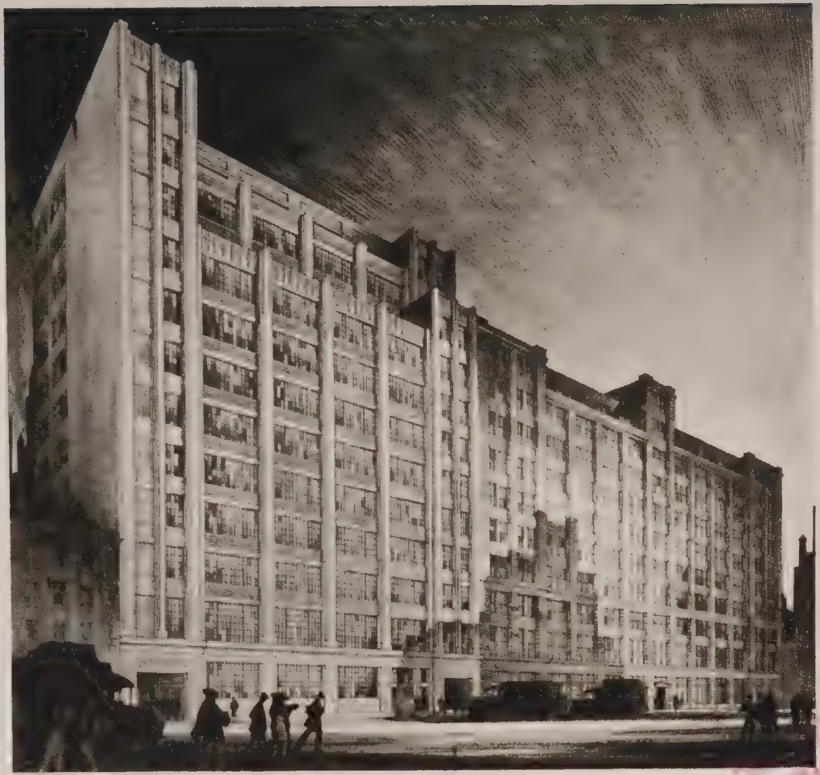
FIRST FLOOR
PLAN. NORTH STATION INDUSTRIAL BUILDING, BOSTON
S. SCOTT JOY, ARCHITECT

COST AND CONSTRUCTION DATA

Year of Completion: 1927.
Type of Construction: Flat slab.
Exterior Materials: Face brick, terra cotta and concrete.
Floors: Cement.
Windows: Steel sash.
Heating: Low pressure steam.
Cubic Foot Cost: 21 cents, exclusive of architect's fee.
Total Cost: $952,067, exclusive of architect's fee.
Use of Building: Heavy warehouse and loft building.



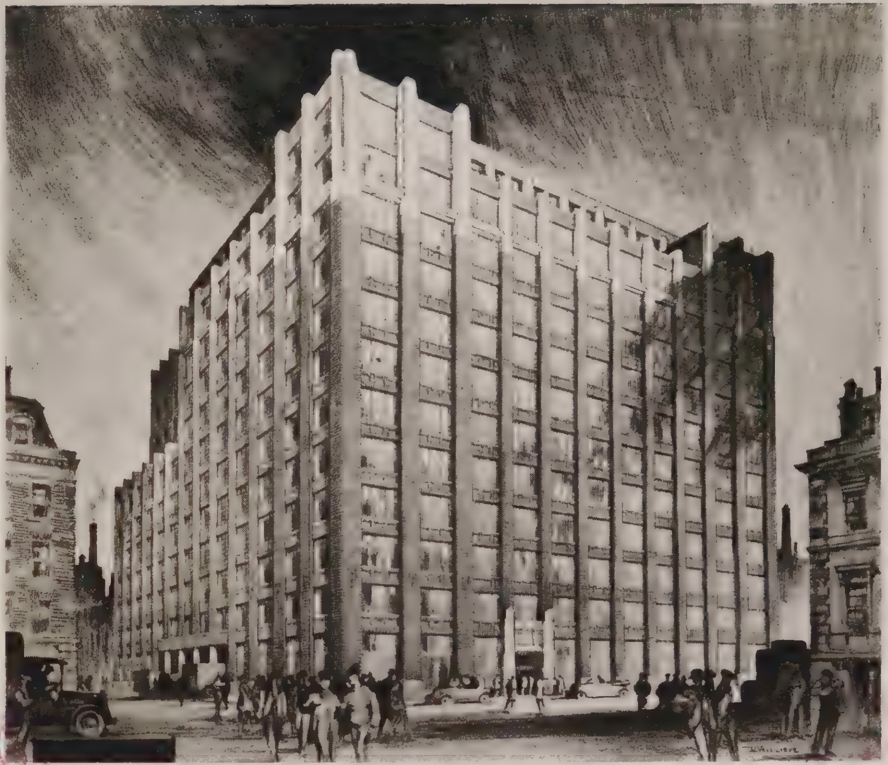
FIRST FLOOR
PLAN. COE TERMINAL WAREHOUSE, DETROIT
S. SCOTT JOY, ARCHITECT



From the Architect's Preliminary Sketches *Plan on Back*

ADDITION TO WOLFF BOOK BINDERY, NEW YORK

FRANK S. PARKER, ARCHITECT AND ENGINEER



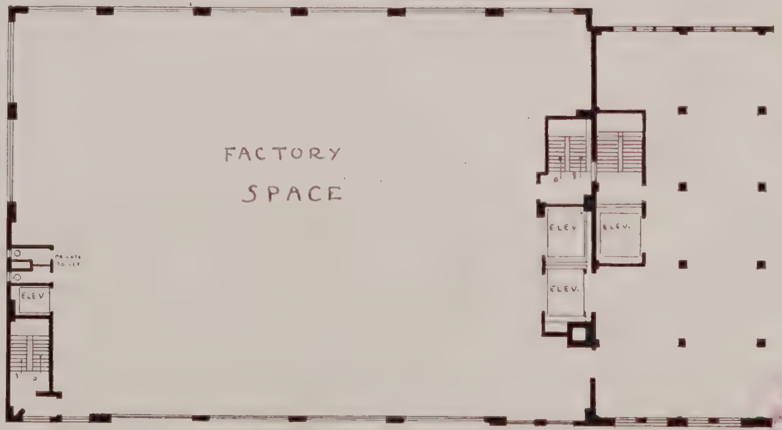
Plan on Back

GRAPHIC ARTS CENTER, NEW YORK

FRANK S. PARKER, ARCHITECT AND ENGINEER

COST AND CONSTRUCTION DATA

Year of Completion: 1926.
Type of Construction: Reinforced concrete.
Exterior Materials: Concrete and brick.
Interior Materials: Concrete and brick.
Floors: Concrete.
Windows: Factory type steel sash.
Heating: Vacuum, low pressure.
Cubic Foot Cost: 26 cents.
Total Cost: $502,000, exclusive of land and financing.
Use of Building: Bookbinding, printing and allied trades.

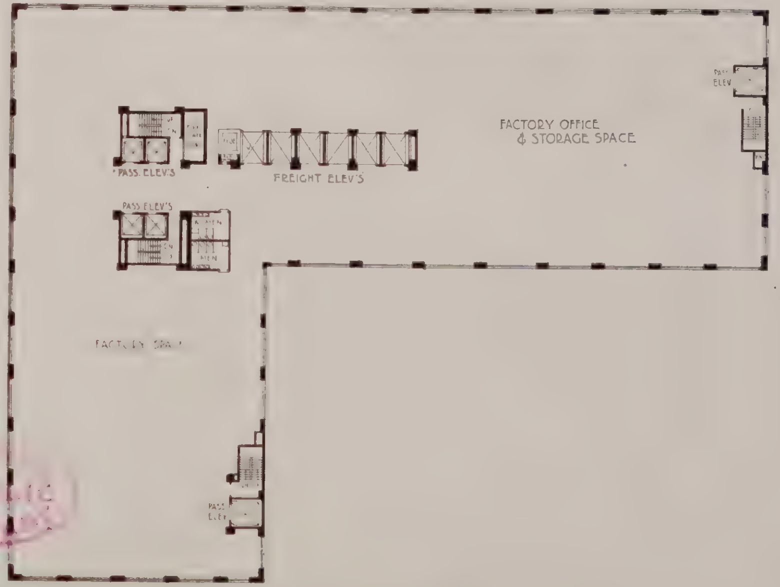


A TYPICAL FLOOR

PLAN. ADDITION TO WOLFF BOOK BINDERY, NEW YORK
FRANK S. PARKER, ARCHITECT AND ENGINEER

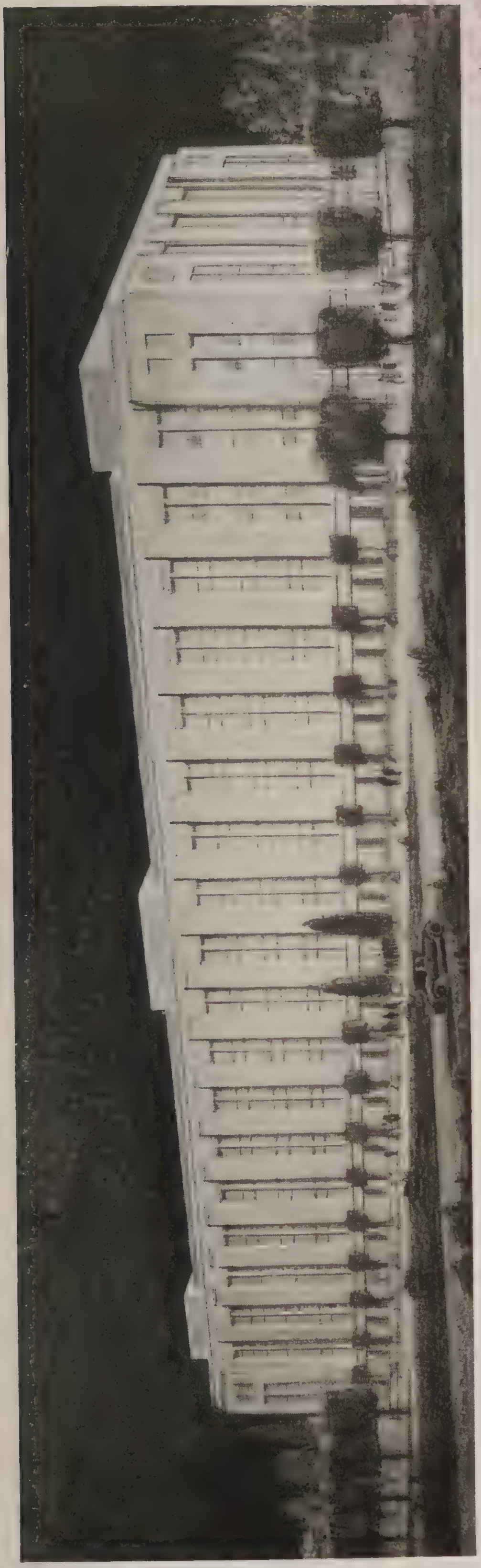
COST AND CONSTRUCTION DATA

Year of Completion: 1927.
Type of Construction: Reinforced concrete.
Exterior Materials: Brick, limestone, granite.
Interior Materials: Concrete, brick, terra cotta.
Floors: Concrete.
Windows: Factory type steel sash.
Heating: Vacuum system, steel boilers, low pressure.
Cubic Foot Cost: 24 cents.
Total Cost: $1,400,000, exclusive of land and financing charges.
Use of Building: Printing and heavy manufacturing.

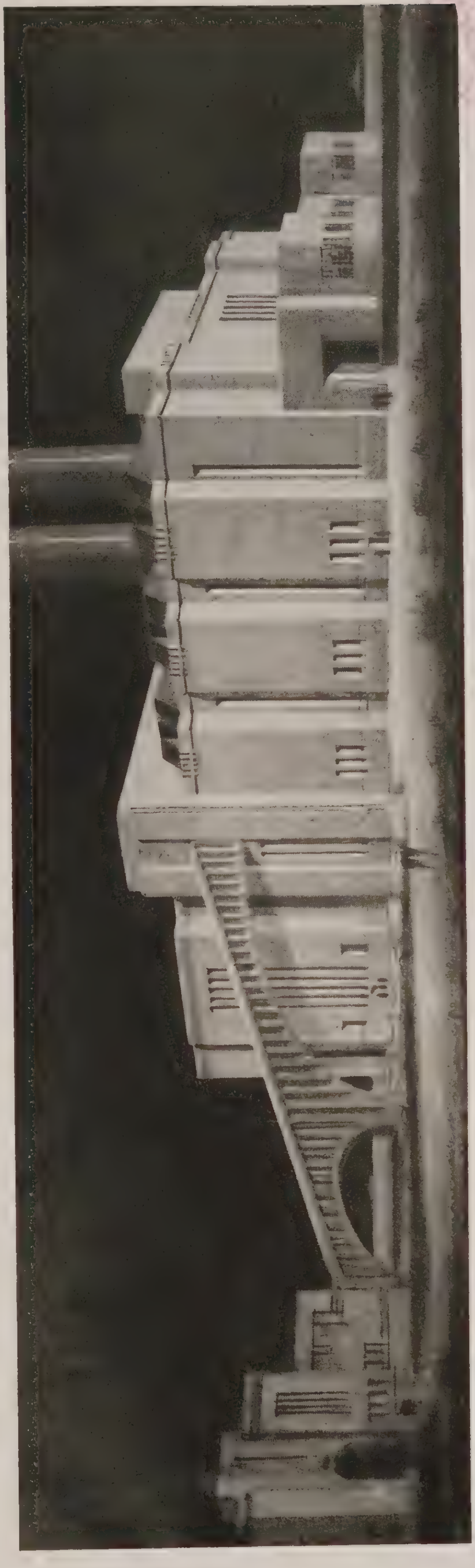


A TYPICAL FLOOR

PLAN. GRAPHIC ARTS CENTER, NEW YORK
FRANK S. PARKER, ARCHITECT AND ENGINEER

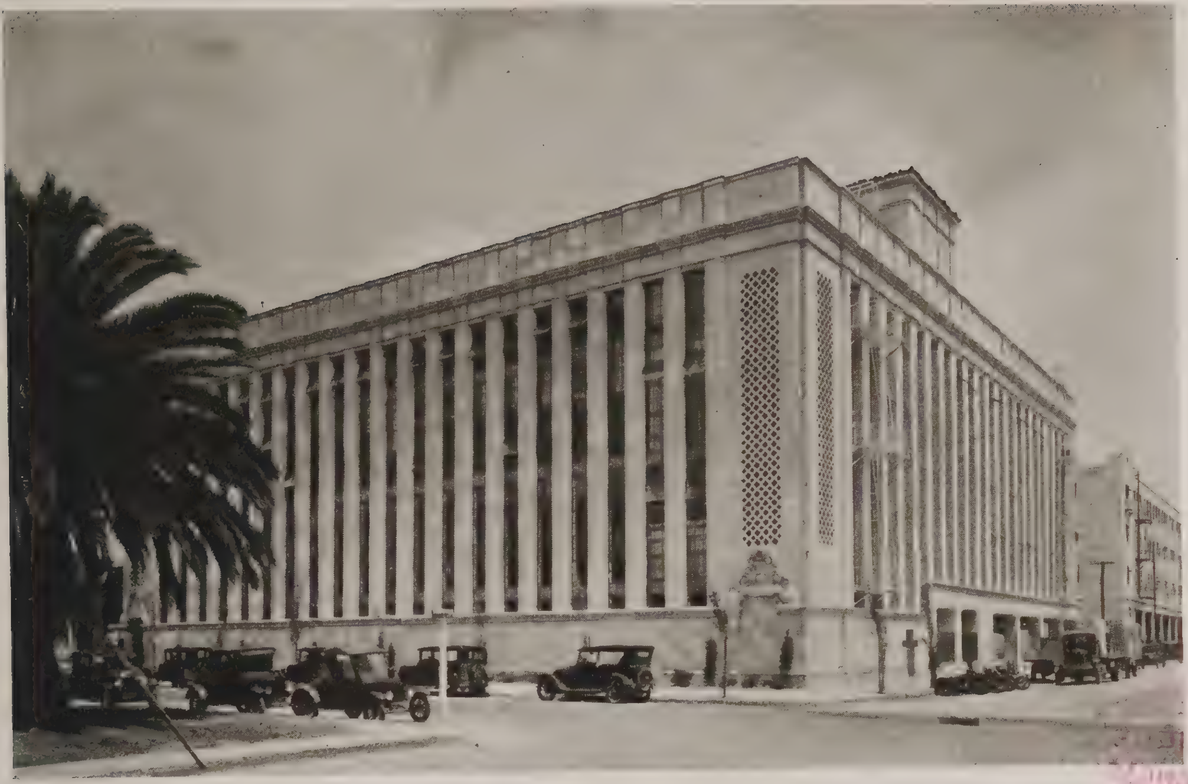


BUILDING FOR THE JEWEL TEA COMPANY, BARRINGTON, ILL.
HOLABIRD & ROOT, ARCHITECTS

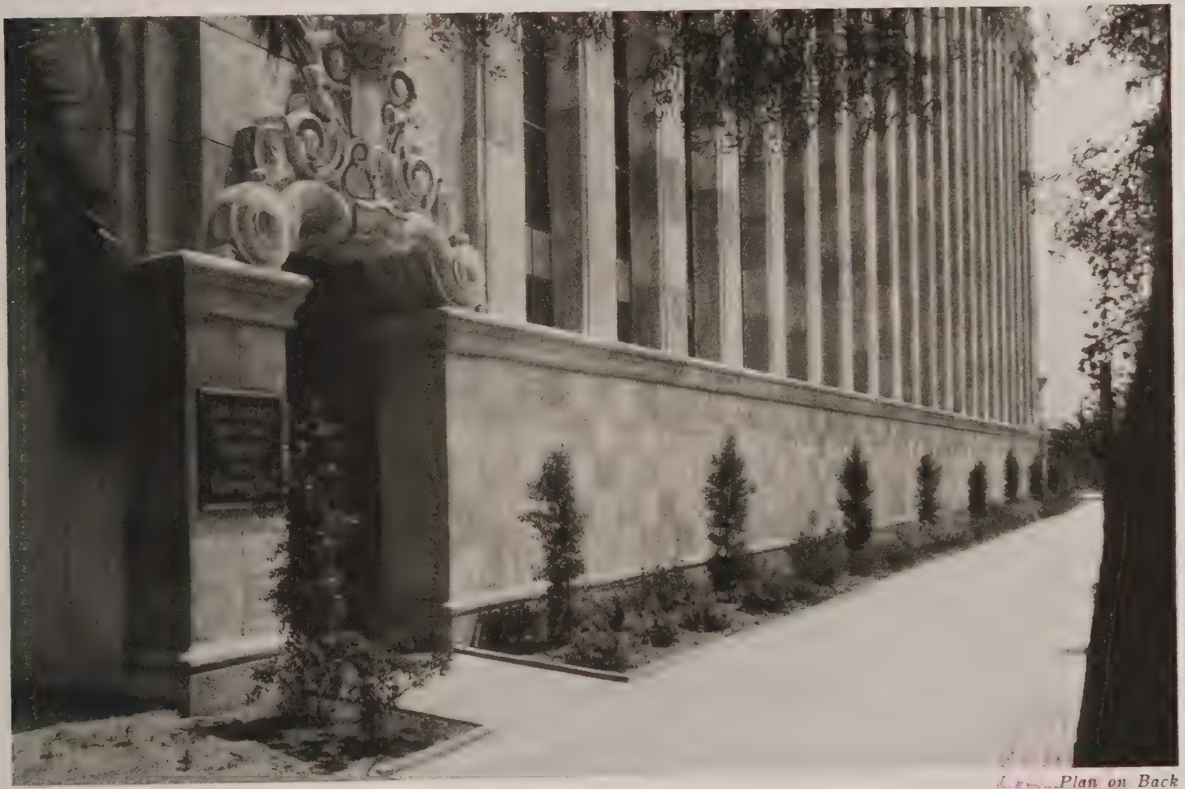


From the Architects' Rendered Drawing

POWER HOUSE, MICHIGAN CITY, IND.
HOLABIRD & ROOT, ARCHITECTS



GENERAL VIEW



Photos. Mott Studios

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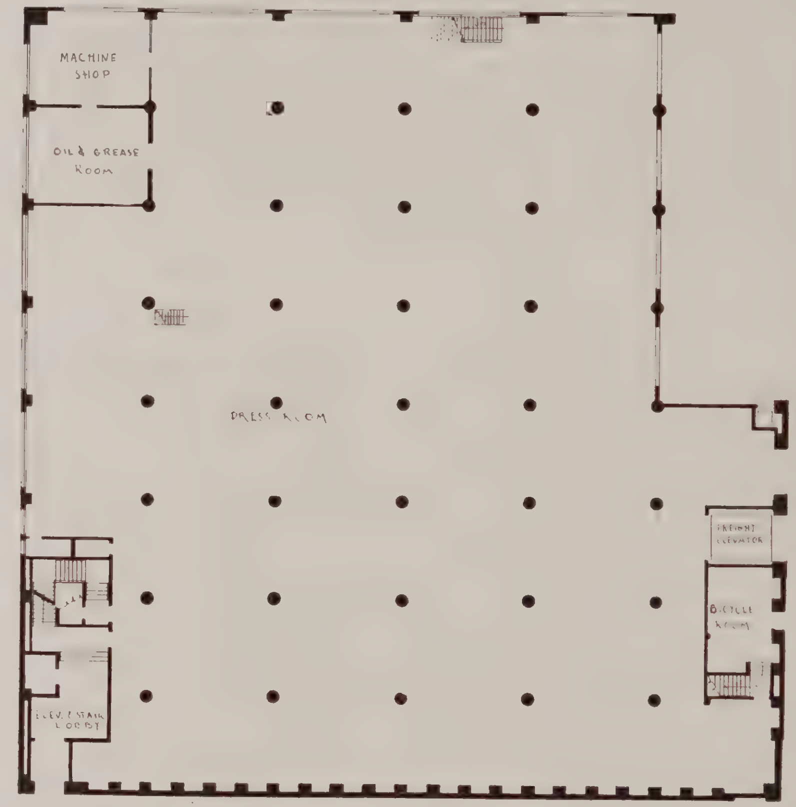
ENTRANCE DETAIL

PRINTING PLANT, LOS ANGELES DOWNTOWN SHOPPING NEWS

MORGAN, WALLS & CLEMENTS, ARCHITECTS

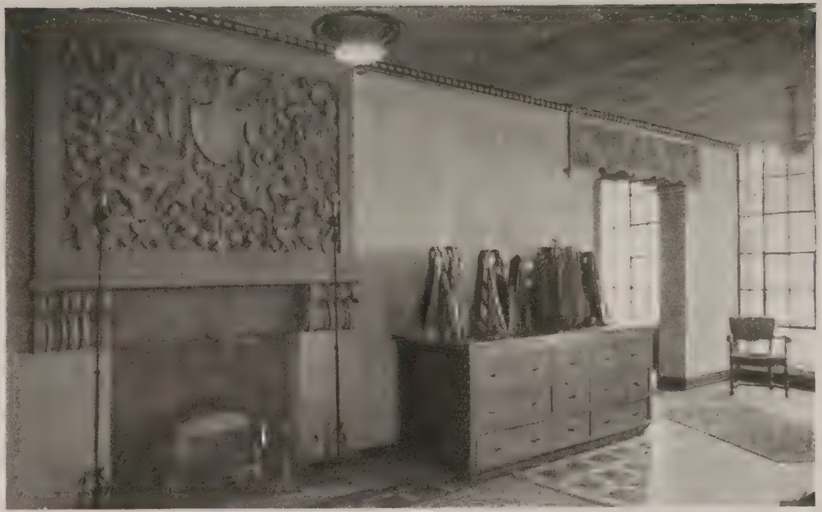
COST AND CONSTRUCTION DATA

Year of Completion: 1928.
Type of Construction: Reinforced concrete.
Exterior Materials: Plaster, cast stone trim.
Windows: Steel sash.
Lighting: Direct, with some special and some indirect.
Heating: Gas steam radiators.
Ventilation: Mechanical exhaust system serving some portions of building.
Cubic Foot Cost: 23 cents.
Total Cost: $323,000.
Use of Building: Newspaper printing plant.

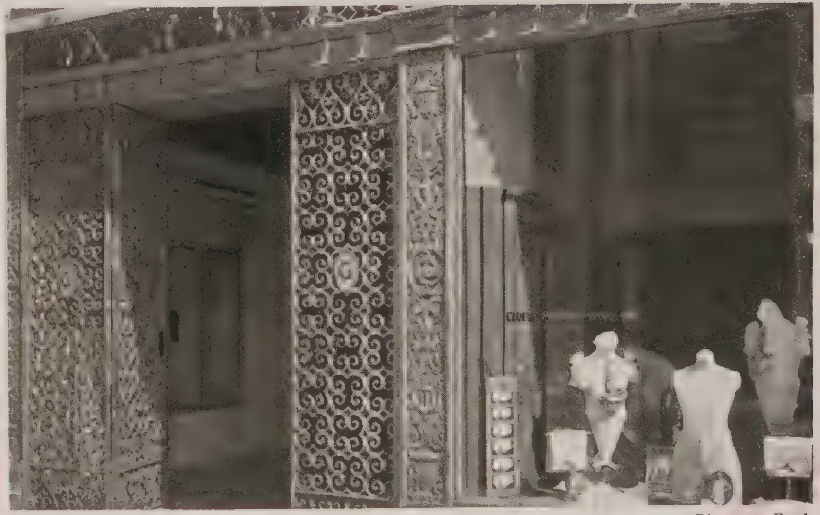


FIRST FLOOR

PLAN, PRINTING PLANT, LOS ANGELES
DOWNTOWN SHOPPING NEWS
MORGAN, WALLS & CLEMENTS, ARCHITECTS



SALES ROOM



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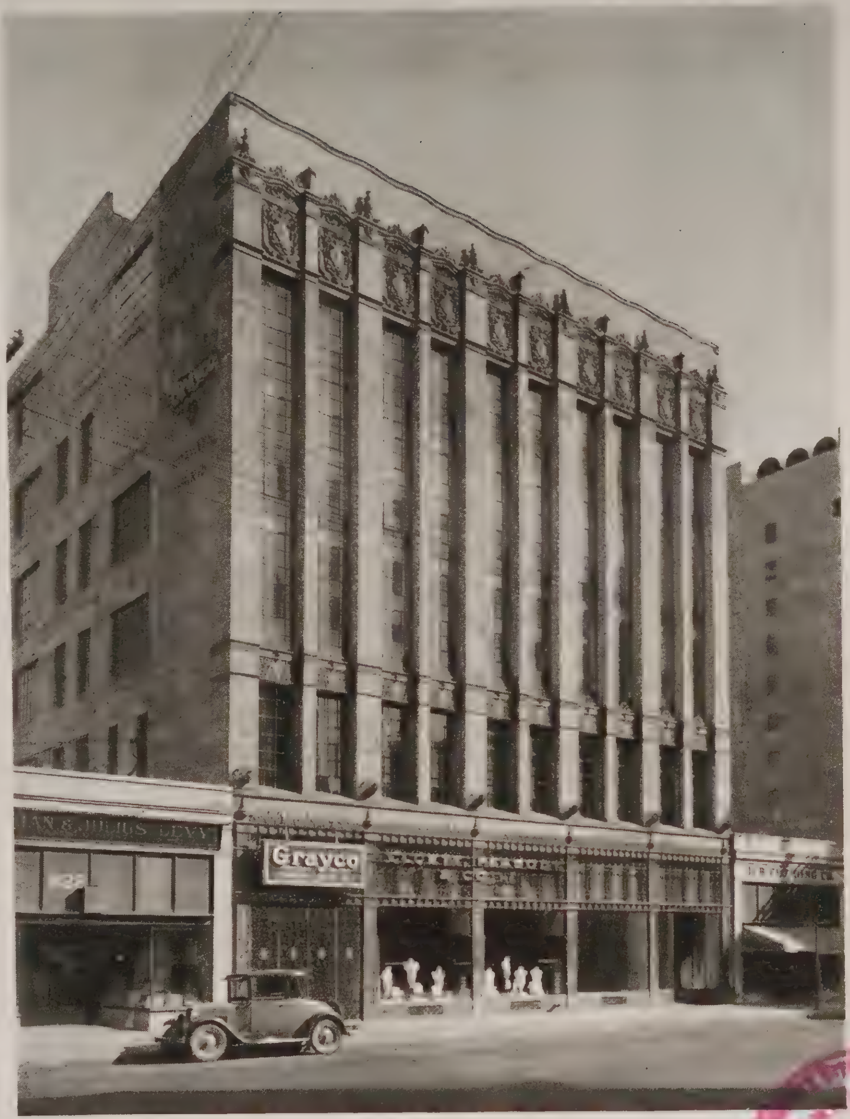
MAIN ENTRANCE



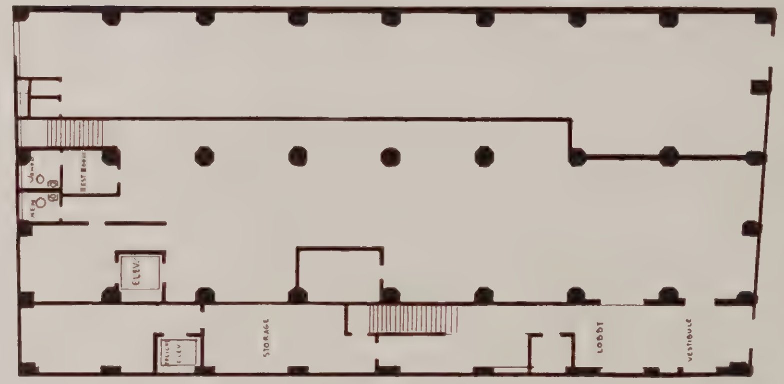
Photos. Mott Studios

GENERAL VIEW

GRAYCO SHIRT FACTORY, LOS ANGELES
MORGAN, WALLS & CLEMENTS, ARCHITECTS

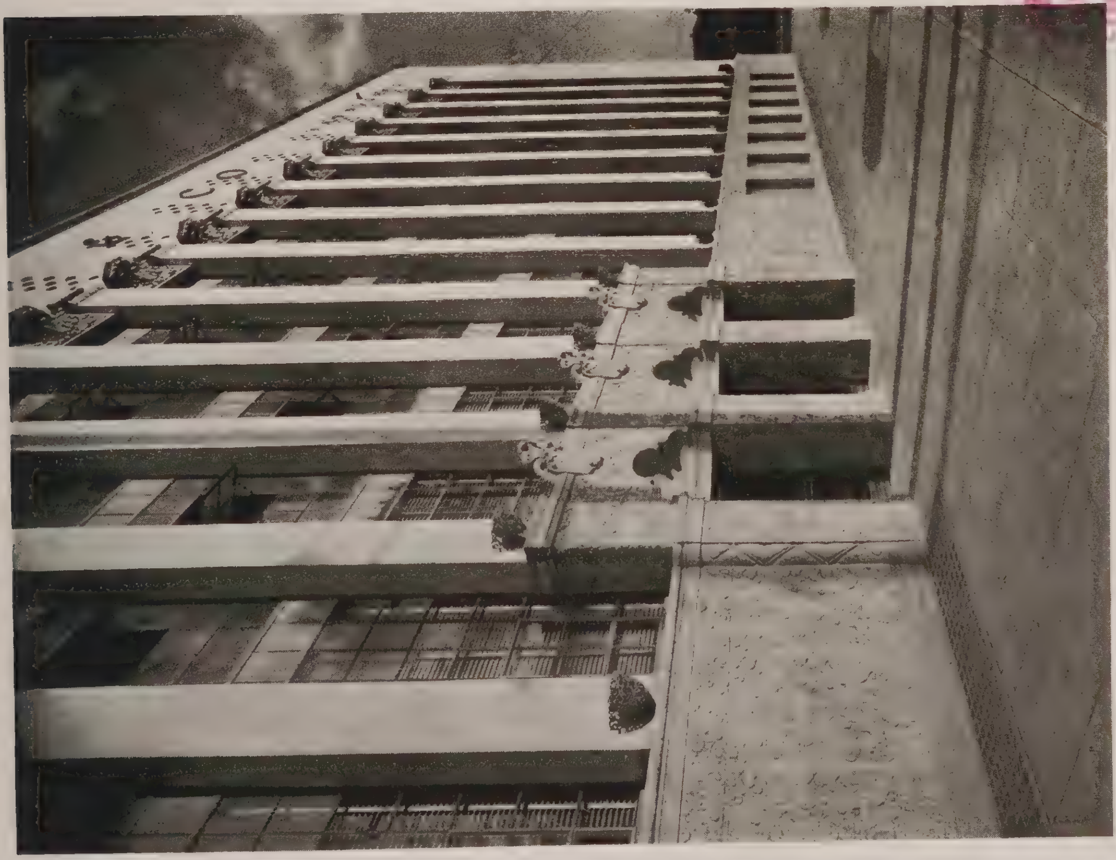
COST AND CONSTRUCTION DATA

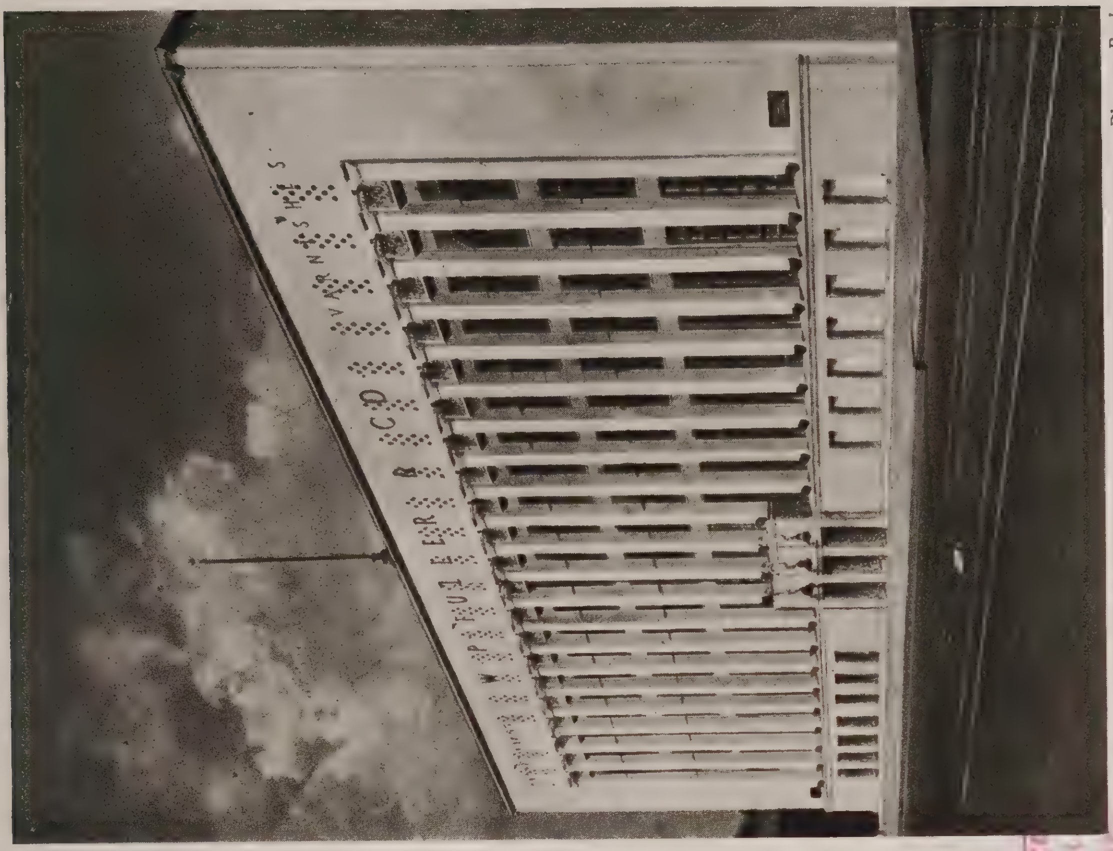
Year of Completion: 1926.
Type of Construction: Reinforced concrete.
Exterior Materials: Plaster, cast stone trim, wrought iron grilles.
Floors: Cement, and rubber tile in shops.
Windows: Steel sash.
Lighting: General illumination.
Heating: Gas steam radiators.
Cubic Foot Cost: 20 cents.
Total Cost: $136,000.
Use of Building: Shirt factory.



MAIN FLOOR

PLAN. GRAYCO SHIRT FACTORY, LOS ANGELES
MORGAN, WALLS & CLEMENTS, ARCHITECTS





Photos, Mott Studios

Plan on Back

MAIN ENTRANCE

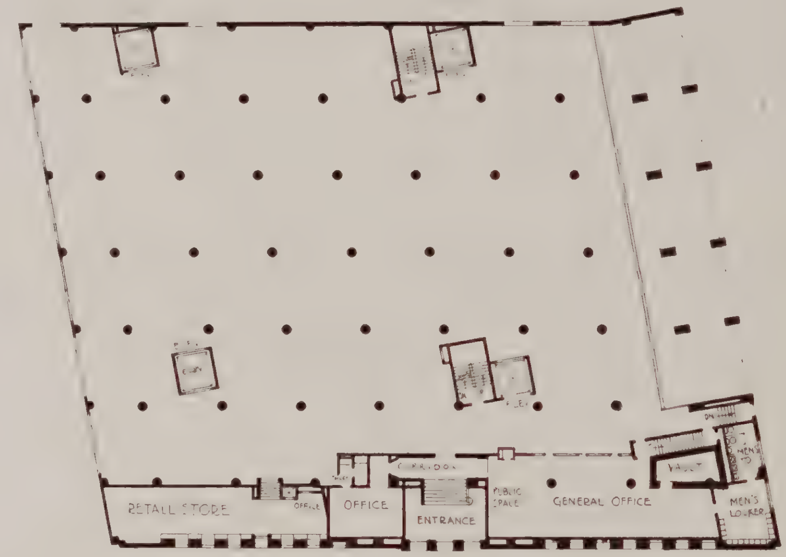
FRONT FACADE

W. P. FULLER & CO. WAREHOUSE, LOS ANGELES

MORGAN, WALLS & CLEMENTS, ARCHITECTS

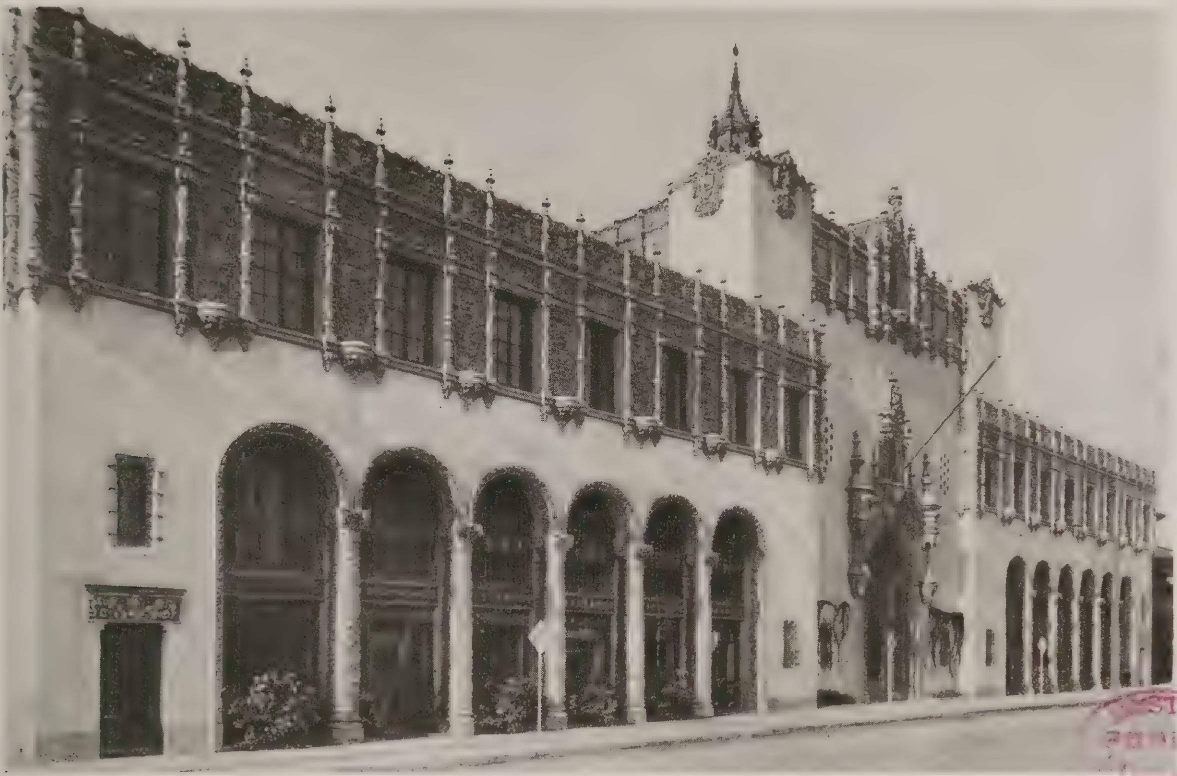
COST AND CONSTRUCTION DATA

Year of Completion: 1925.
Type of Construction: Reinforced concrete.
Exterior Materials: Plaster walls, cast stone and cement tile trim.
Interior Materials: Plaster walls.
Floors: Cement.
Windows: Steel sash.
Lighting: General illumination.
Heating: Gas steam radiators.
Cubic Foot Cost: 20 cents.
Total Cost: $348,000.
Use of Building: Warehouse.



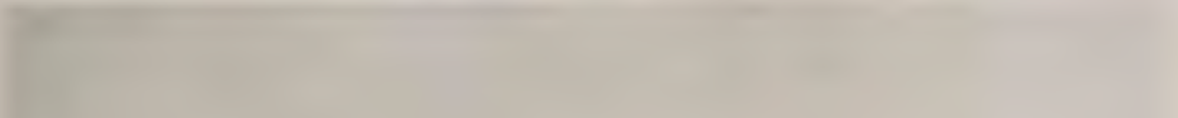
FIRST FLOOR

PLAN, W. P. FULLER & CO. WAREHOUSE, LOS ANGELES
MORGAN, WALLS & CLEMENTS, ARCHITECTS



Plan on Back

PRINTING PLANT AND OFFICES, LOS ANGELES EVENING HERALD
MORGAN, WALLS & CLEMENTS, ARCHITECTS

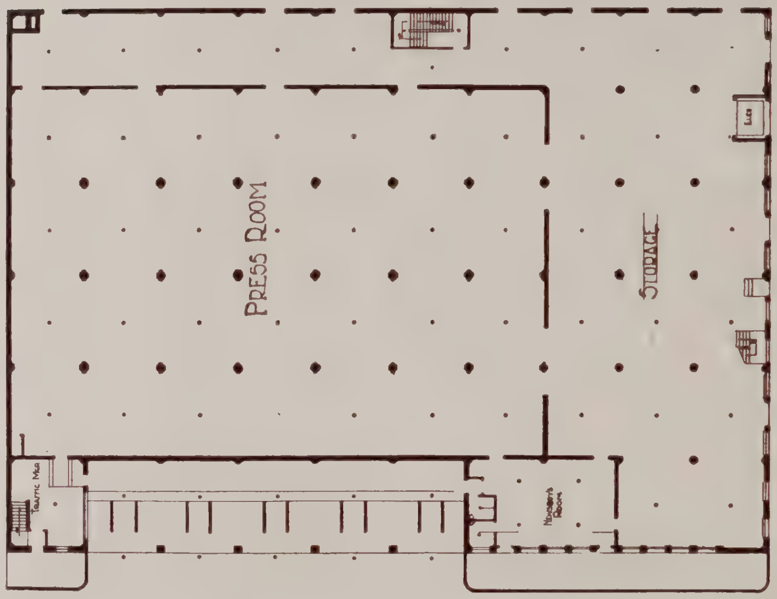


Photos. Mott Studios

BUILDING FOR THE HOLLYWOOD PAPER BOX CORP. AND GENE TILDEN FURNITURE CO., LOS ANGELES
MORGAN, WALLS & CLEMENTS, ARCHITECTS

COST AND CONSTRUCTION DATA

Year of Completion: 1926.
Type of Construction: Reinforced concrete.
Exterior Materials: Plaster; cast stone trim; wrought iron grilles.
Interior Materials: Cast stone; marble; plaster.
Floors: Tile.
Windows: Wood on street front; steel elsewhere.
Lighting: General illumination with special fixtures in offices, public spaces, etc.
Heating: 2-pipe low-pressure steam.
Ventilation: Mechanical.
Cubic Foot Cost: 34 cents.
Total Cost: $768,500.
Use of Building: Newspaper printing plant.



FIRST FLOOR

PLAN. PLANT AND OFFICES, LOS ANGELES EVENING HERALD
MORGAN, WALLS & CLEMENTS, ARCHITECTS

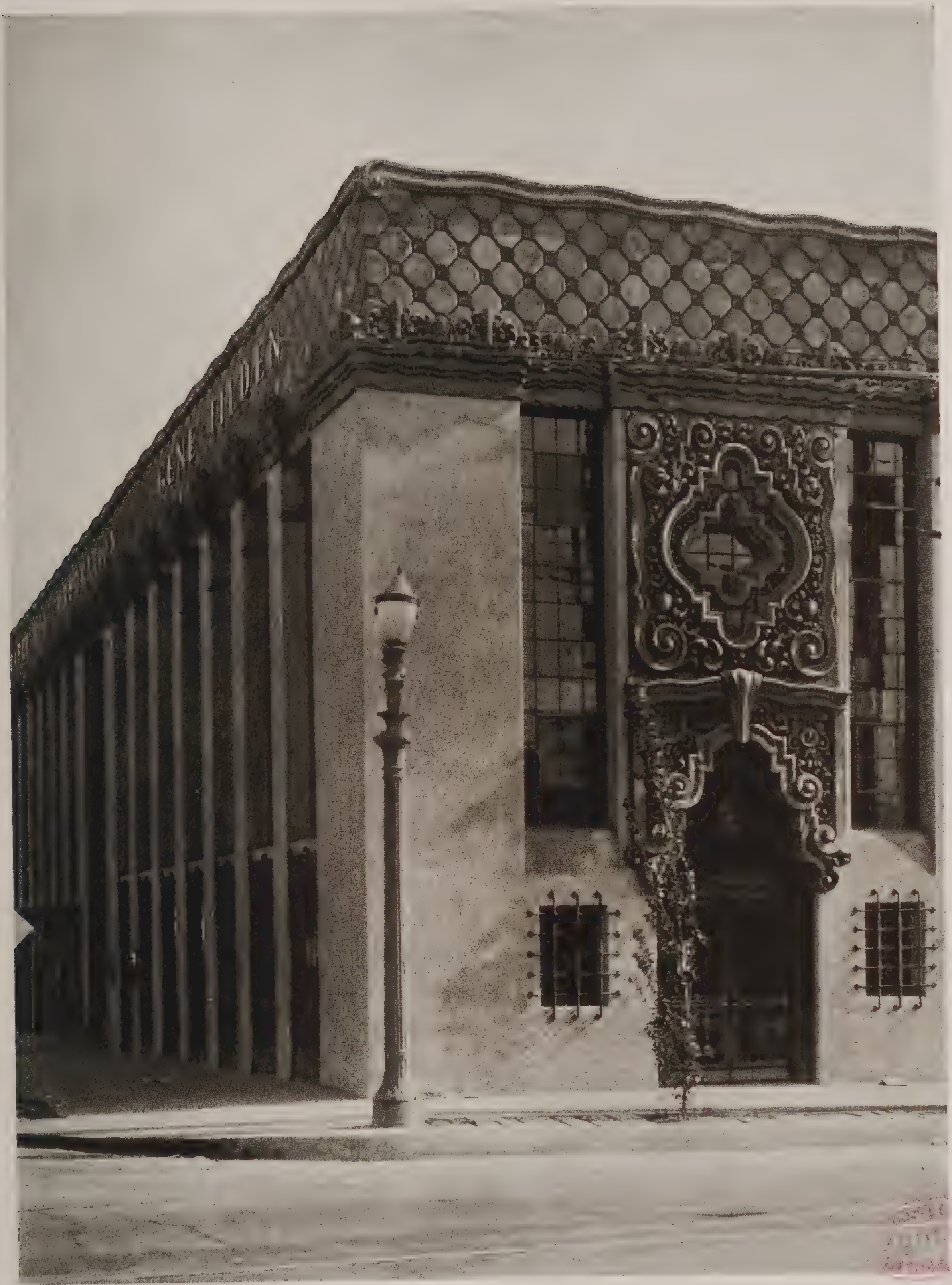


Photo. Mott Studios

SIDE ENTRANCE
BUILDING FOR THE HOLLYWOOD PAPER BOX CORP. AND GENE TILDEN FURNITURE CO., LOS ANGELES
MORGAN, WALLS & CLEMENTS, ARCHITECTS

COST AND CONSTRUCTION DATA

Year of Completion: 1925.

Type of Construction: First floor concrete; second floor frame.

Exterior Materials: Brick, plaster, cast stone trim.

Windows: Steel sash.

Lighting: General illumination.

Heating: Gas steam radiators.

Total Cost: $135,360.

Use of Building: Manufacturing.

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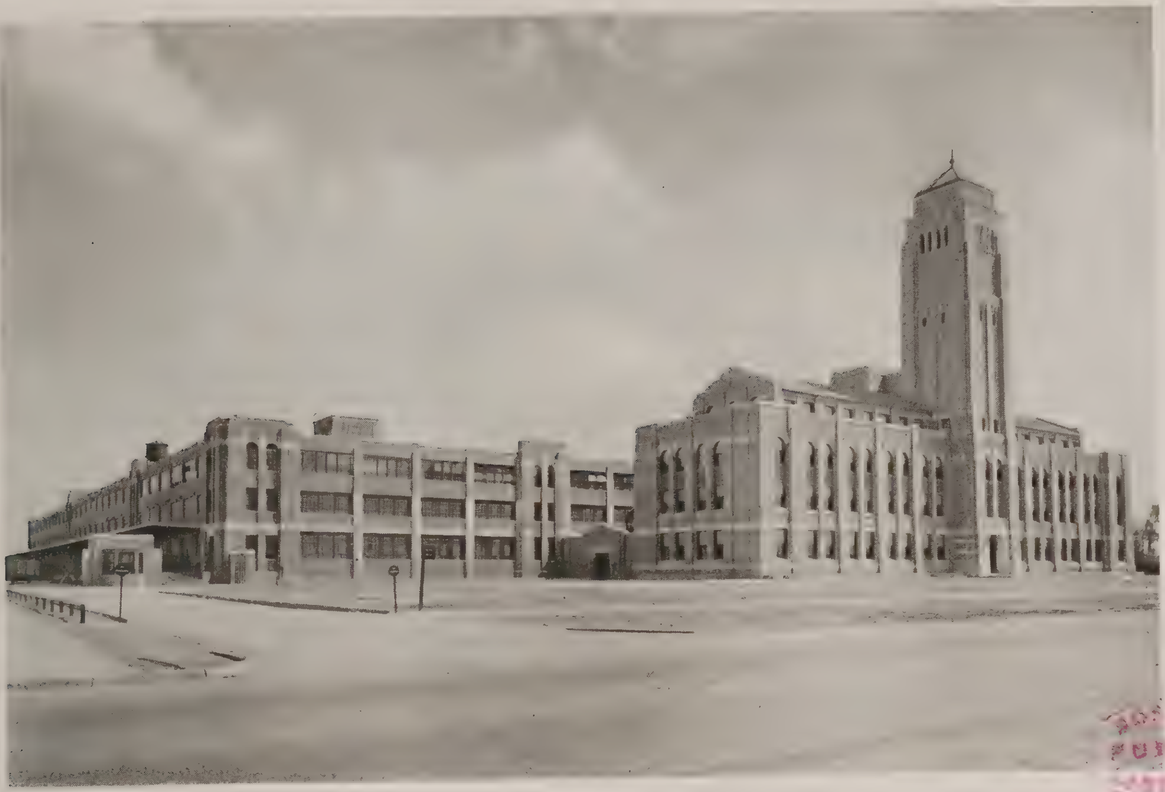
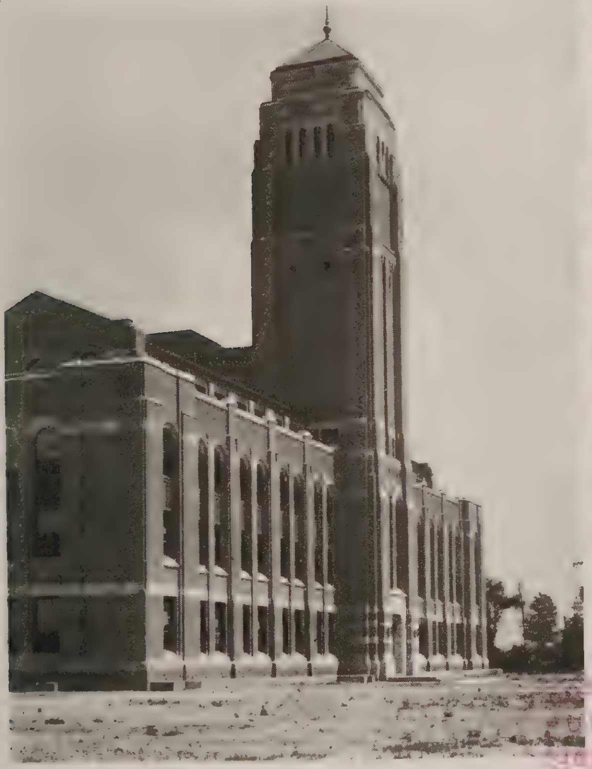
BUILDING FOR THE HOLLYWOOD PAPER BOX CORP. AND
GENE TILDEN FURNITURE CO., LOS ANGELES
MORGAN, WALLS & CLEMENTS, ARCHITECTS

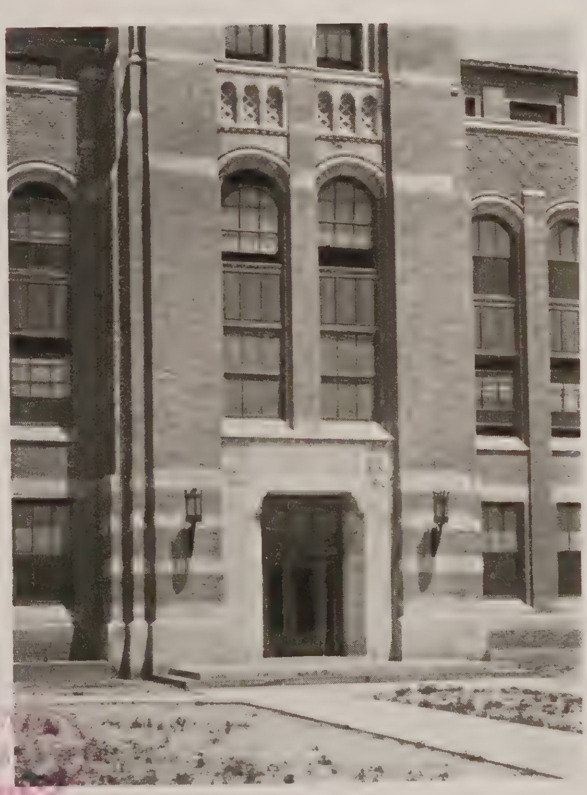


GENERAL VIEW



Photos. Thomas Ellison

FRONT ELEVATION



MAIN ENTRANCE

BUILDING FOR THE KELVINATOR CO., DETROIT

SMITH, HINCHMAN & GRYLLS, ARCHITECTS

CONSTRUCTION DATA

Type of Construction: Reinforced concrete.

Exterior Materials: Brick, artificial stone, limestone.

Interior Materials: Brick and exposed concrete; tile walls plastered in office building.

Floors: Cement.

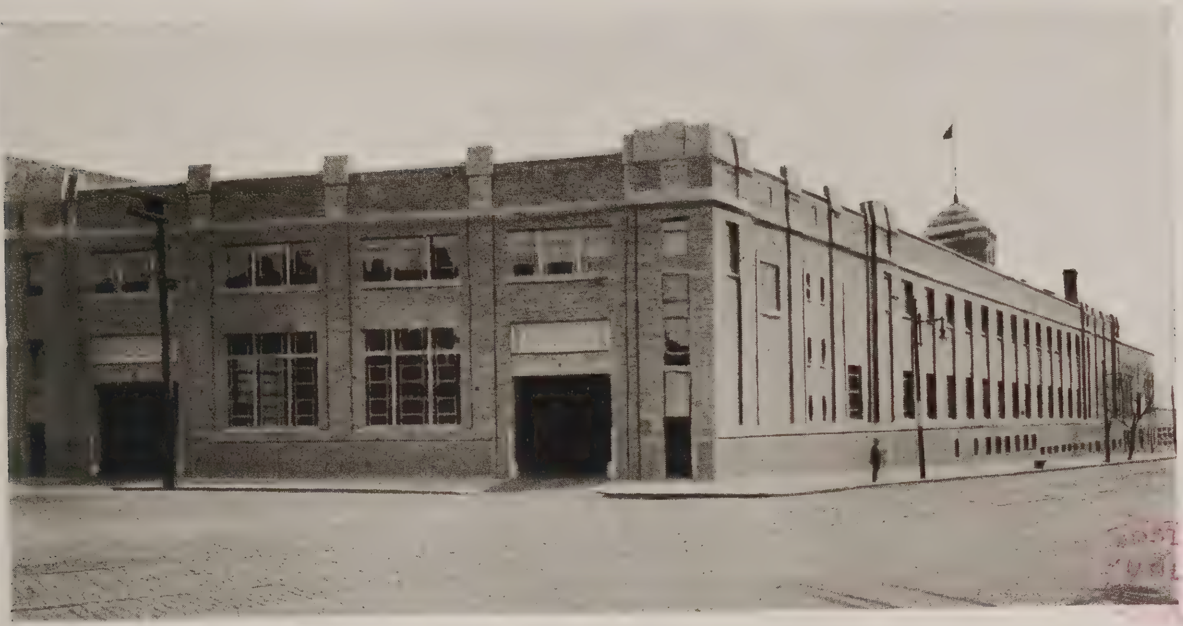
Windows: Steel side wall sash; double-hung steel in office building.

Lighting: Direct.

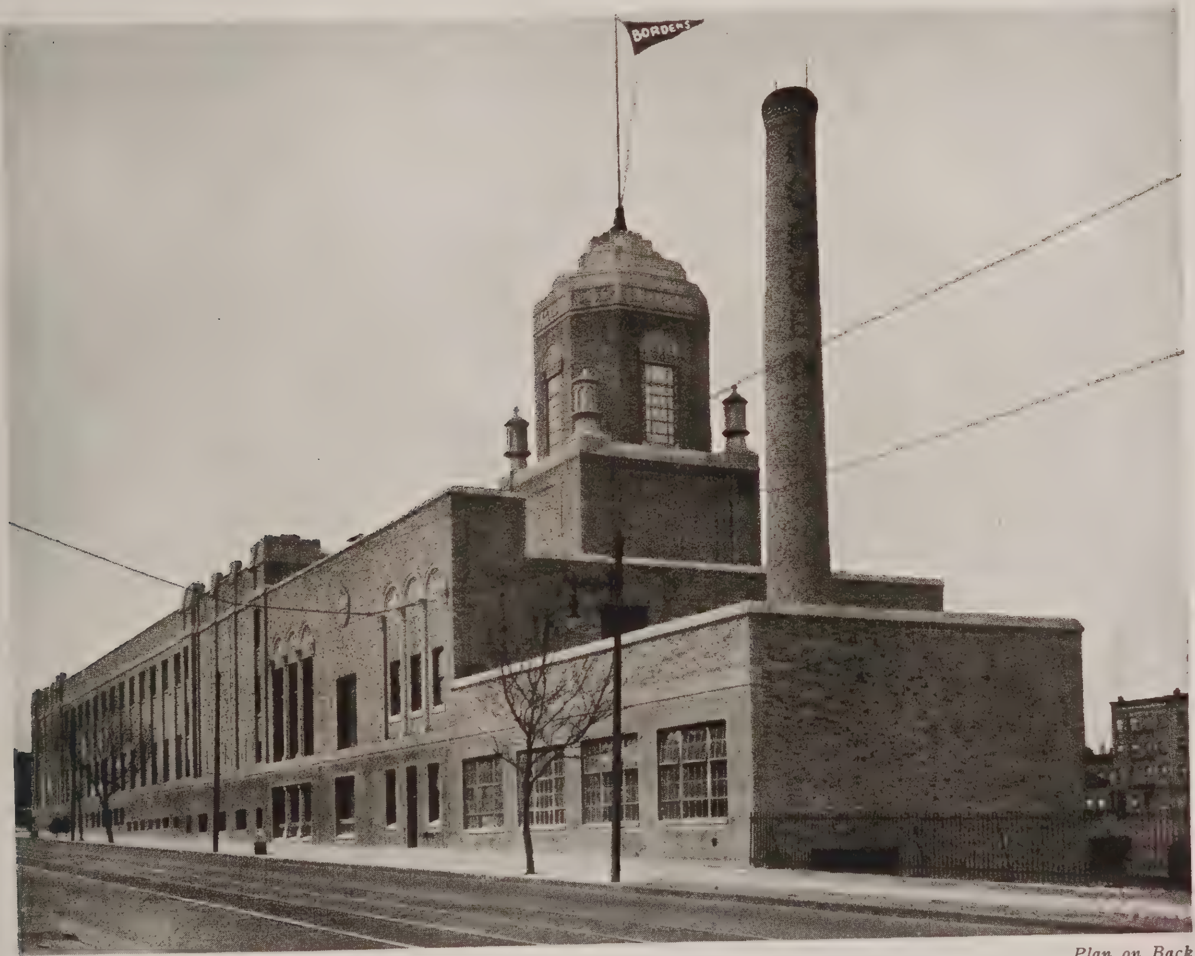
Heating: Direct radiation.

Use of Building: Office and factory for manufacture of electric refrigerators.

BUILDING FOR THE KELVINATOR CO., DETROIT
SMITH, HINCHMAN & GRYLLS, ARCHITECTS



END ELEVATION



Photos. Wm. F. Cone

Plan on Back

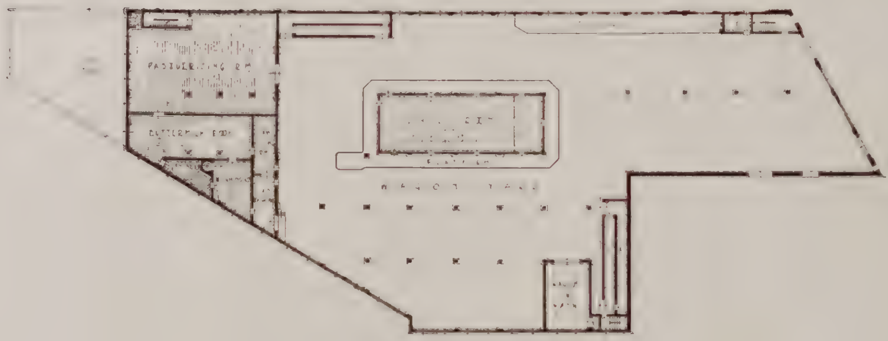
MAIN FACADE

BUILDING FOR THE BORDEN COMPANY, NEWARK

WILLIAM E. LEHMAN, ARCHITECT

COST AND CONSTRUCTION DATA

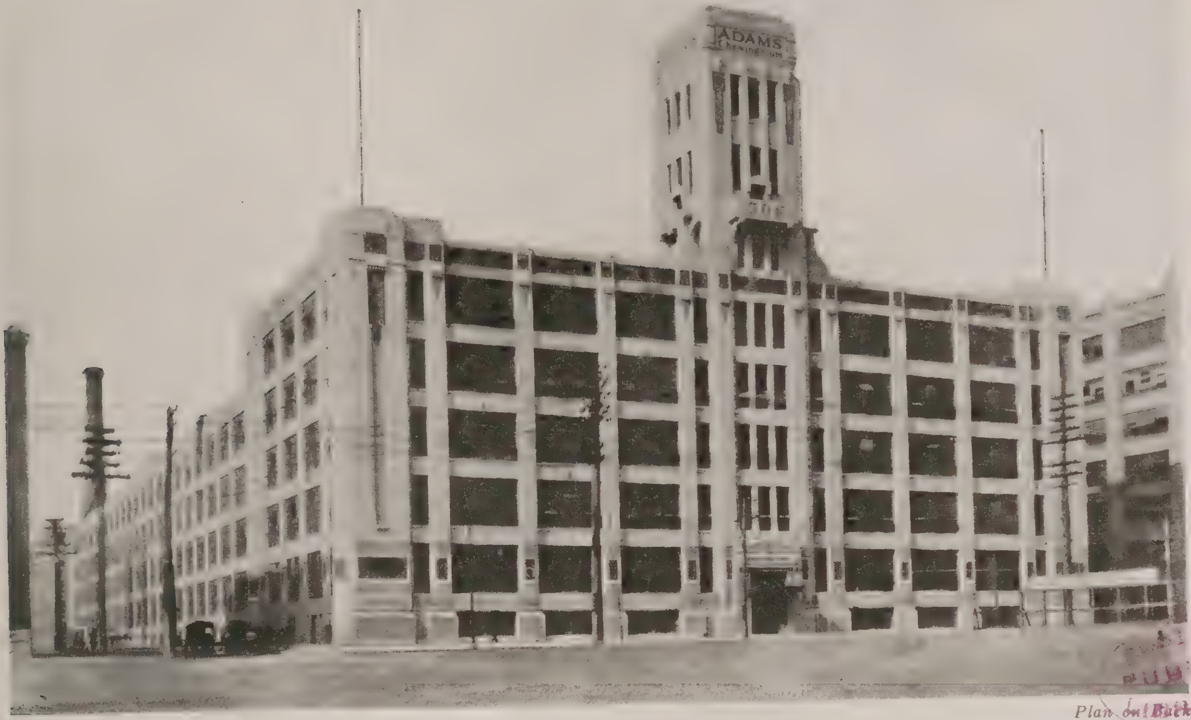
Type of Construction: Steel and reinforced concrete.
Exterior Materials: Brick and terra cotta.
Interior Materials: Concrete and terra cotta partitions.
Floors: Concrete and tiled sidewalls.
Windows: Steel.
Lighting: Electricity.
Heating: Steam.
Ventilating: Forced draft.
Use of Building: Milk bottling.



FIRST FLOOR

PLAN. BUILDING FOR THE BORDEN COMPANY, NEWARK
WILLIAM E. LEHMAN, ARCHITECT

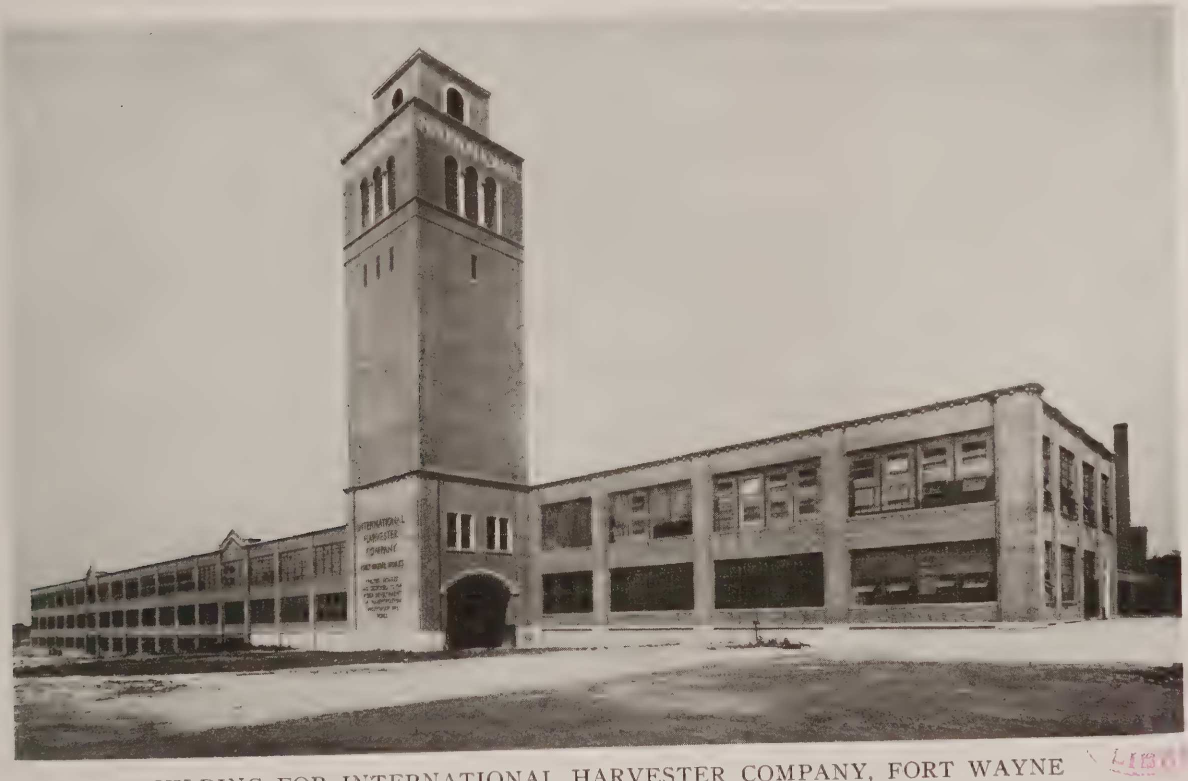
BOSTON PUBLIC LIBRARY



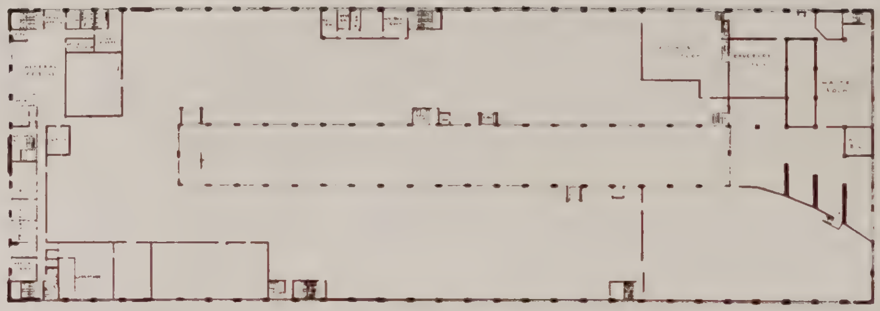
Plan on Back

PUBLIC LIBRARY

BUILDING FOR AMERICAN CHICLE COMPANY, LONG ISLAND CITY
THE BALLINGER COMPANY, ARCHITECTS AND ENGINEERS



BUILDING FOR INTERNATIONAL HARVESTER COMPANY, FORT WAYNE
HOLABIRD & ROOT, CONSULTING ARCHITECTS
DESIGN AND CONSTRUCTION BY DAY & ZIMMERMAN,
DIVISION OF UNITED ENGINEERS & CONSTRUCTORS, INC.



FIRST FLOOR

PLAN. BUILDING FOR AMERICAN CHICLE COMPANY, LONG ISLAND CITY
THE BALLINGER COMPANY, ARCHITECTS AND ENGINEERS

LIBRARY

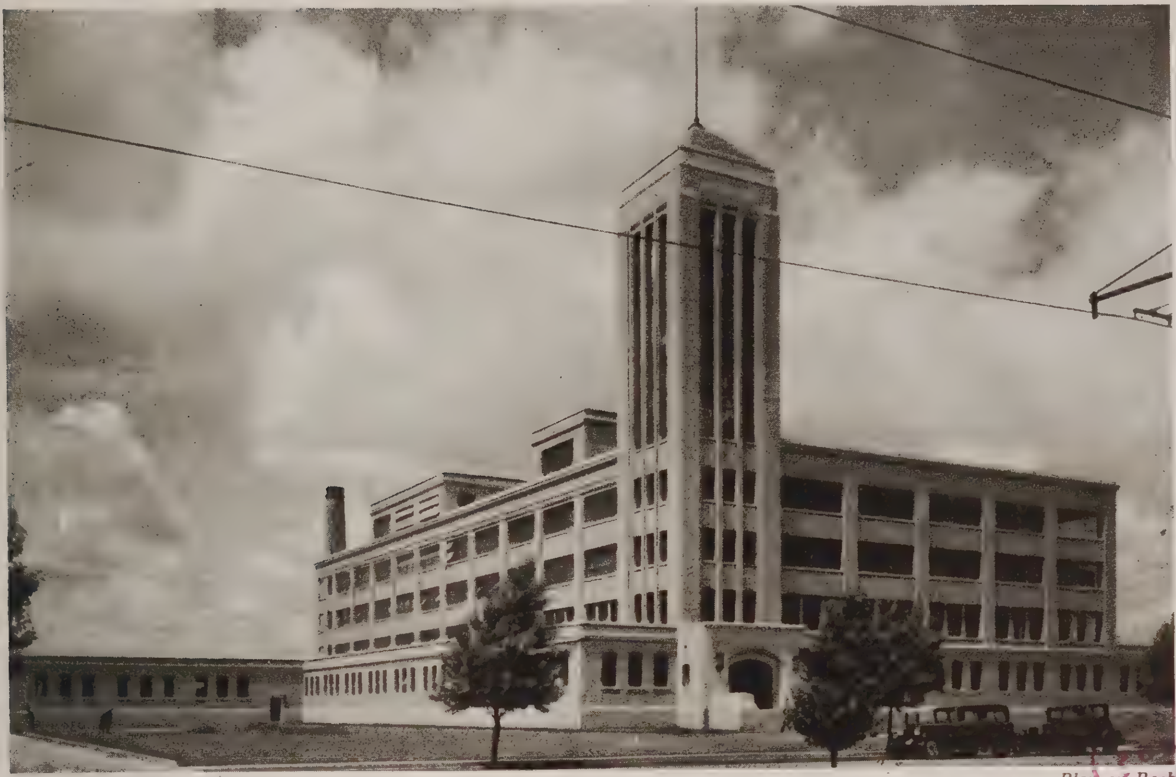


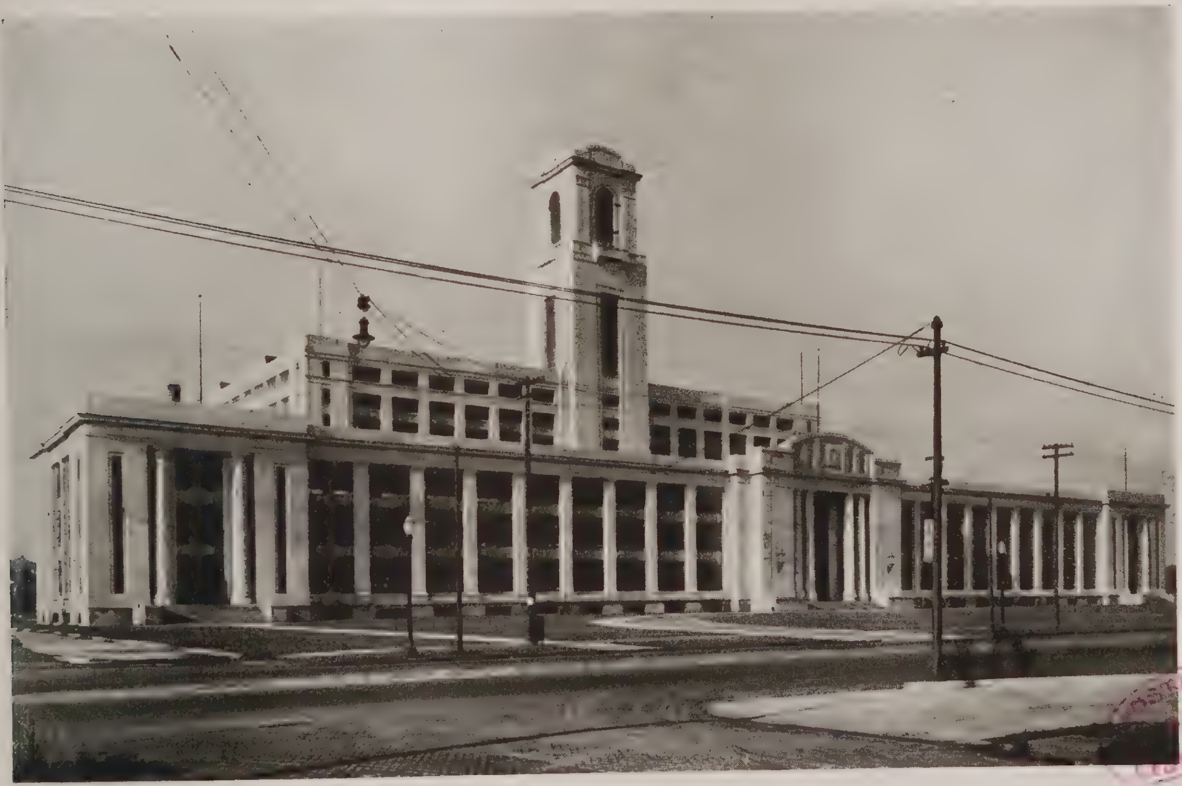
Photo. Norton & Peel

Plan on Back

BUILDING FOR CREAM OF WHEAT COMPANY, MINNEAPOLIS

WALTER H. WHEELER, ARCHITECT AND ENGINEER

BOSTON PUBLIC LIBRARY



BOSTON PUBLIC LIBRARY

BUILDING FOR MONTGOMERY WARD & CO., ST. PAUL

DESIGNED BY LOCKWOOD GREENE ENGINEERS, INC.

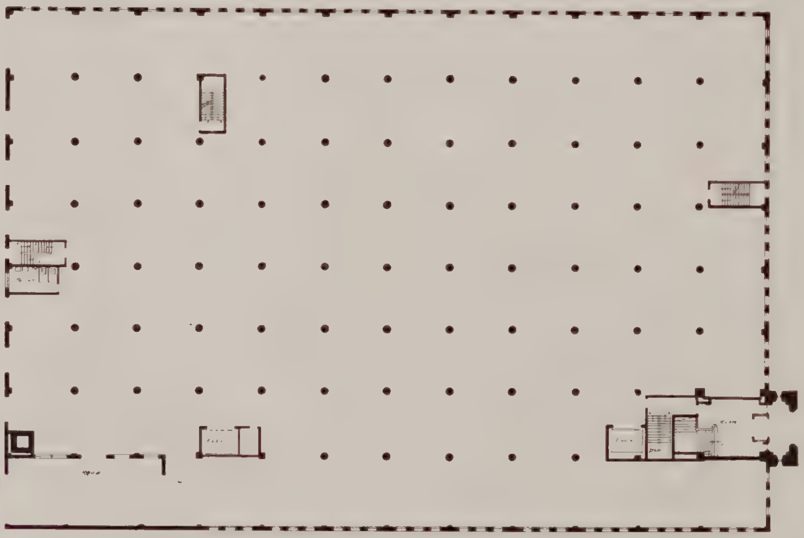
CONSTRUCTION DATA

Type of Construction: Reinforced concrete, stone front.
Exterior Materials: Rear, concrete brick; front, stone.
Interior Materials: Reinforced concrete.
Floors: Concrete.
Windows: Steel.
Lighting: Electricity.
Heating: Radiators.
Use of Building: Warehouse and office building.

ABOVE. BUILDING FOR MONTGOMERY WARD & CO., ST. PAUL
DESIGNED BY LOCKWOOD GREENE ENGINEERS, INC.

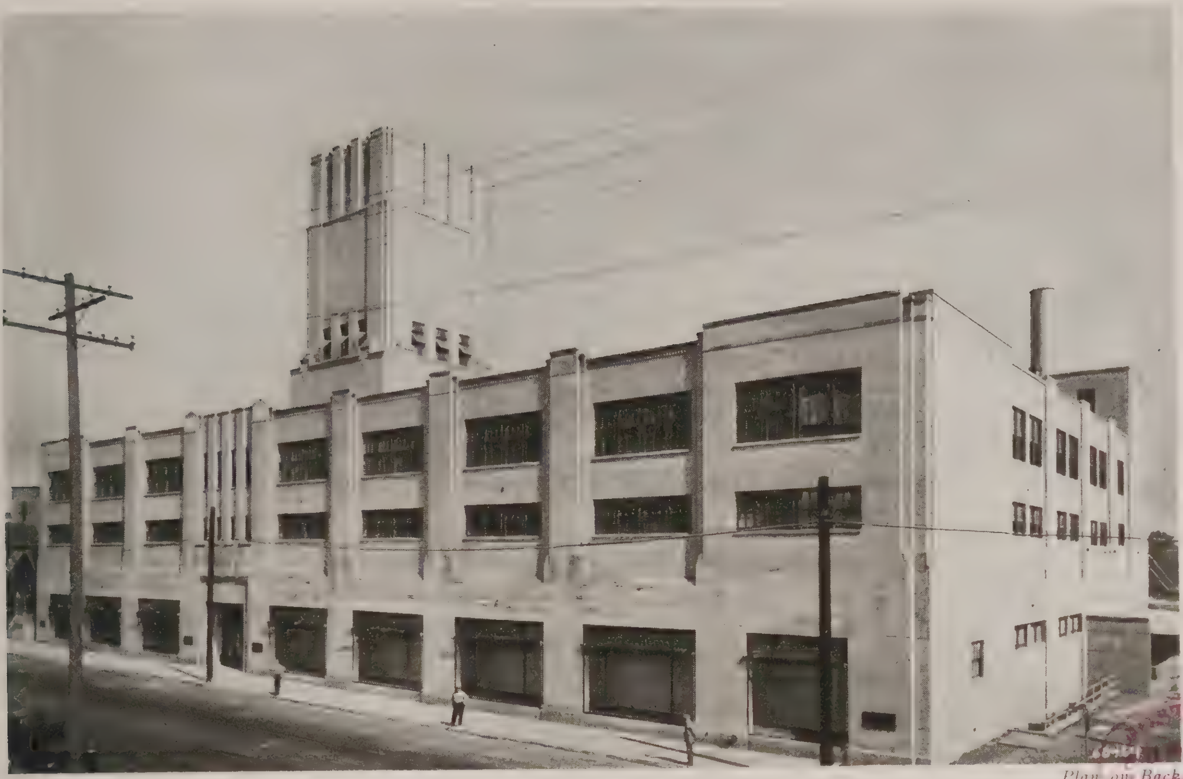
CONSTRUCTION DATA

Type of Construction: Reinforced concrete, flat slab, fireproof.
Exterior Materials: Brick and stone.
Interior Materials: Tile partitions, brick and mahogany.
Floors: Cement finish, linoleum in general office, teak in private offices.
Windows: Steel factory sash and metal, double-hung.
Lighting: Electricity.
Heating: Vacuum, steam.
Ventilating: Indirect system.
Use of Building: Factory building and general office.



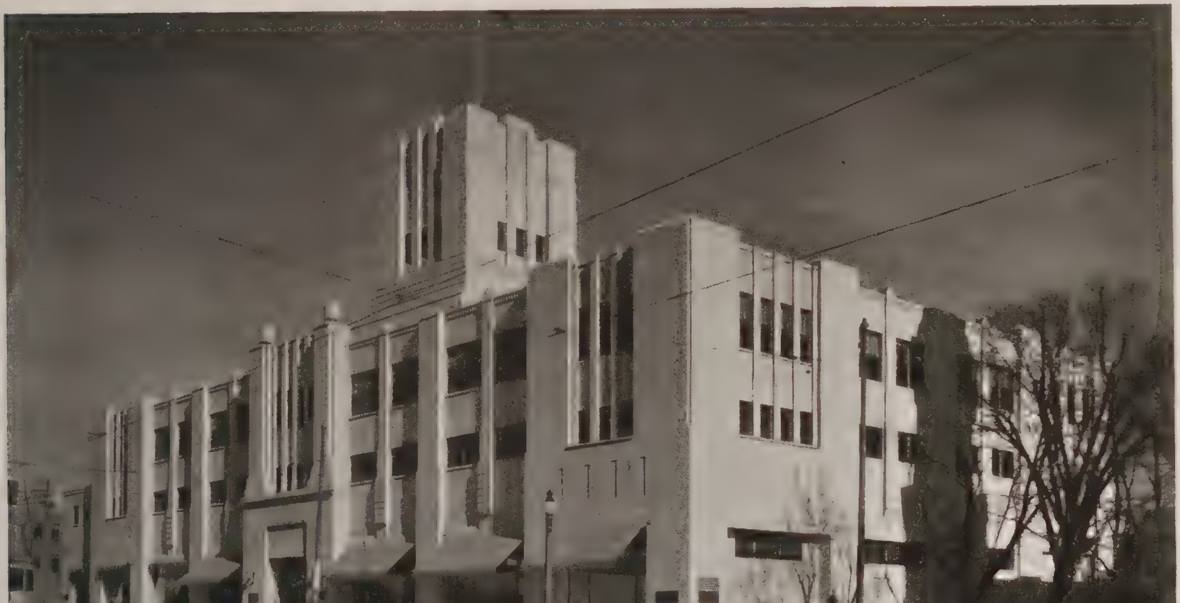
BOSTON PUBLIC LIBRARY

PLAN. BUILDING FOR CREAM OF WHEAT COMPANY, MINNEAPOLIS
WALTER H. WHEELER, ARCHITECT AND ENGINEER



Plan on Back

BUILDING FOR SEARS, ROEBUCK & CO., MILWAUKEE
NIMMONS, CARR & WRIGHT, ARCHITECTS

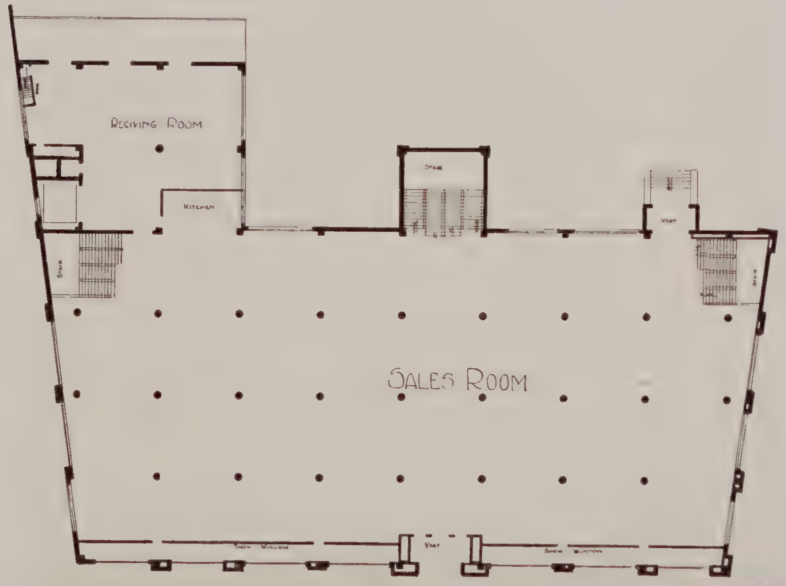


Plan on Back

BUILDING FOR SEARS, ROEBUCK & CO., CAMBRIDGE, MASS.
NIMMONS, CARR & WRIGHT, ARCHITECTS

CONSTRUCTION DATA

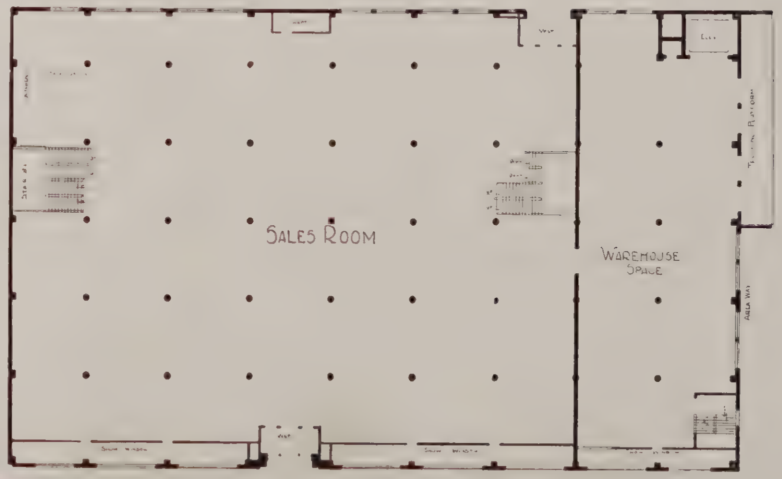
Year of Completion: 1928.
Type of Construction: Reinforced concrete, flat slab construction.
Exterior Materials: Face brick and cut stone.
Interior Materials: First and second floors, plastered walls and ceiling, wood trim, wood and metal doors; third floor, brick walls, concrete ceiling.
Floors: First and second floors, maple; basement and third floor, cement.
Windows: Steel sash.
Lighting: Semi-indirect.
Heating: Vacuum system, direct radiation throughout for heating ventilating system.
Ventilating: Fresh air and extraction.
Use of Building: Mail order store.



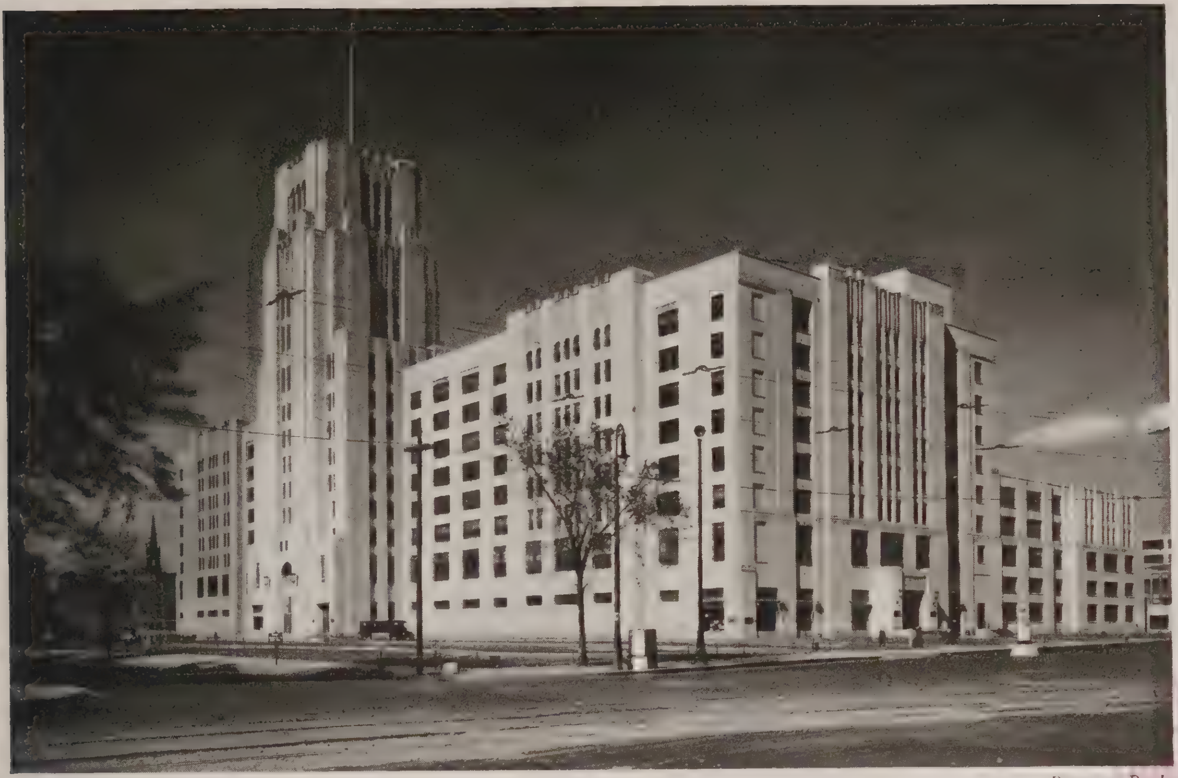
FIRST FLOOR
PLAN. BUILDING FOR SEARS, ROEBUCK & CO., CAMBRIDGE, MASS.
NIMMONS, CARR & WRIGHT, ARCHITECTS

CONSTRUCTION DATA

Year of Completion: 1928.
Type of Construction: Reinforced concrete, flat slab construction.
Exterior Materials: Face brick and cut stone.
Interior Materials: First and second floors, plastered walls and ceiling, wood trim, wood and metal doors; third floor, brick walls, concrete ceiling.
Floors: First and second floors, maple; basement and third floor, cement.
Windows: Steel sash.
Lighting: Semi-indirect.
Heating: Vacuum system, direct radiation throughout for heating ventilating system.
Ventilating: Fresh air and extraction.
Use of Building: Mail order store.



FIRST FLOOR
PLAN. BUILDING FOR SEARS, ROEBUCK & CO., MILWAUKEE
NIMMONS, CARR & WRIGHT, ARCHITECTS



Plan on Back

BUILDING FOR SEARS, ROEBUCK & CO., BOSTON
NIMMONS, CARR & WRIGHT, ARCHITECTS

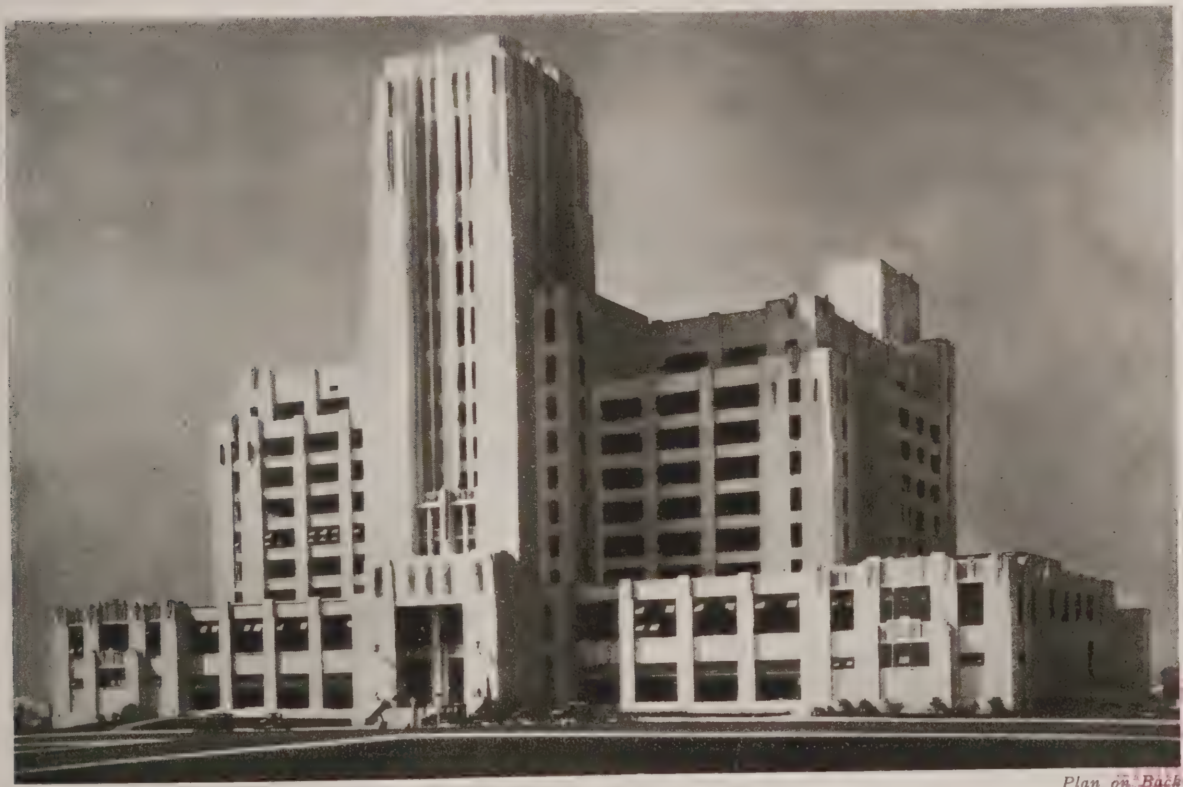


Photo. Dwyer Studio

Plan on Back

BUILDING FOR SEARS, ROEBUCK & CO., LOS ANGELES
NIMMONS, CARR & WRIGHT, ARCHITECTS

CONSTRUCTION DATA

Type of Construction: Reinforced concrete, flat slab construction.

Exterior Materials: Concrete walls, stucco.

Interior Materials: First and second floors, plastered walls and ceiling; rest of building, concrete walls, wood trim, wood and metal doors.

Floors: First and second floors, maple; rest of building, wood blocks; toilet rooms, cement.

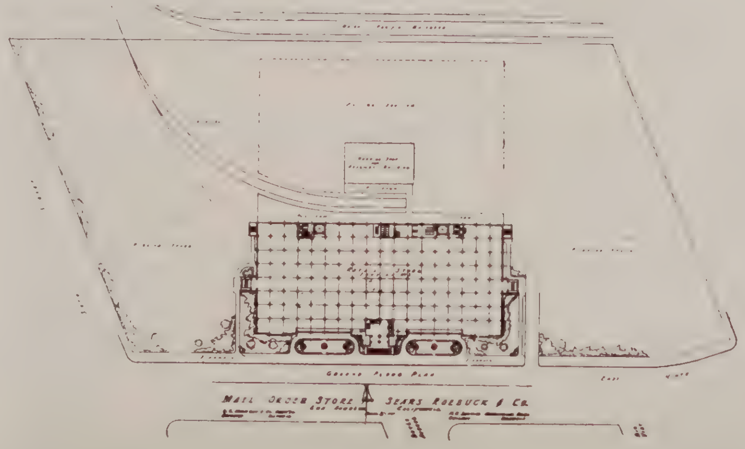
Windows: Steel sash.

Lighting: First and second floors, semi-indirect; rest of building, reflectors on drop cords.

Heating: Boiler plant, oil burners, steam- and electric-driven pumps, vacuum system.

Ventilating: Fresh air and extraction.

Use of Building: Mail order store.



FIRST FLOOR
PLAN. BUILDING FOR SEARS, ROEBUCK & CO., LOS ANGELES
NIMMONS, CARR & WRIGHT, ARCHITECTS

CONSTRUCTION DATA

Type of Construction: Reinforced concrete, flat slab construction.

Exterior Materials: Cut stone and face brick.

Interior Materials: First and second floors and tower, plastered walls and ceiling, wood trim; rest of building, brick walls, concrete ceiling, metal doors.

Floors: First and second floors and tower, maple; rest of building, cement.

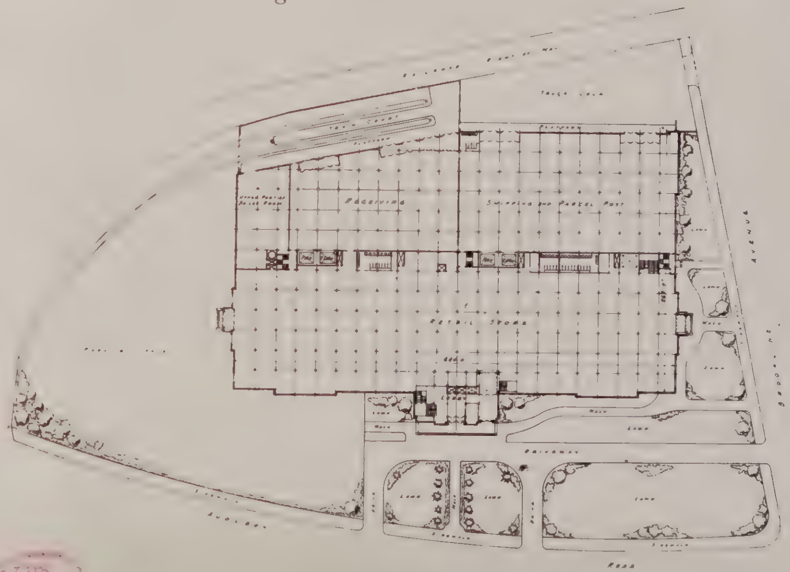
Windows: Steel sash.

Lighting: First and second floors, semi-indirect; rest of building, reflectors on drop cords.

Heating: High pressure boilers, oil burning, steam driven pumps, vacuum system.

Ventilating: Fresh air and extraction; air filters in second floor.

Use of Building: Mail order store.



FIRST FLOOR
PLAN. BUILDING FOR SEARS, ROEBUCK & CO., BOSTON
NIMMONS, CARR & WRIGHT, ARCHITECTS

BOSTON PUBLIC LIBRARY

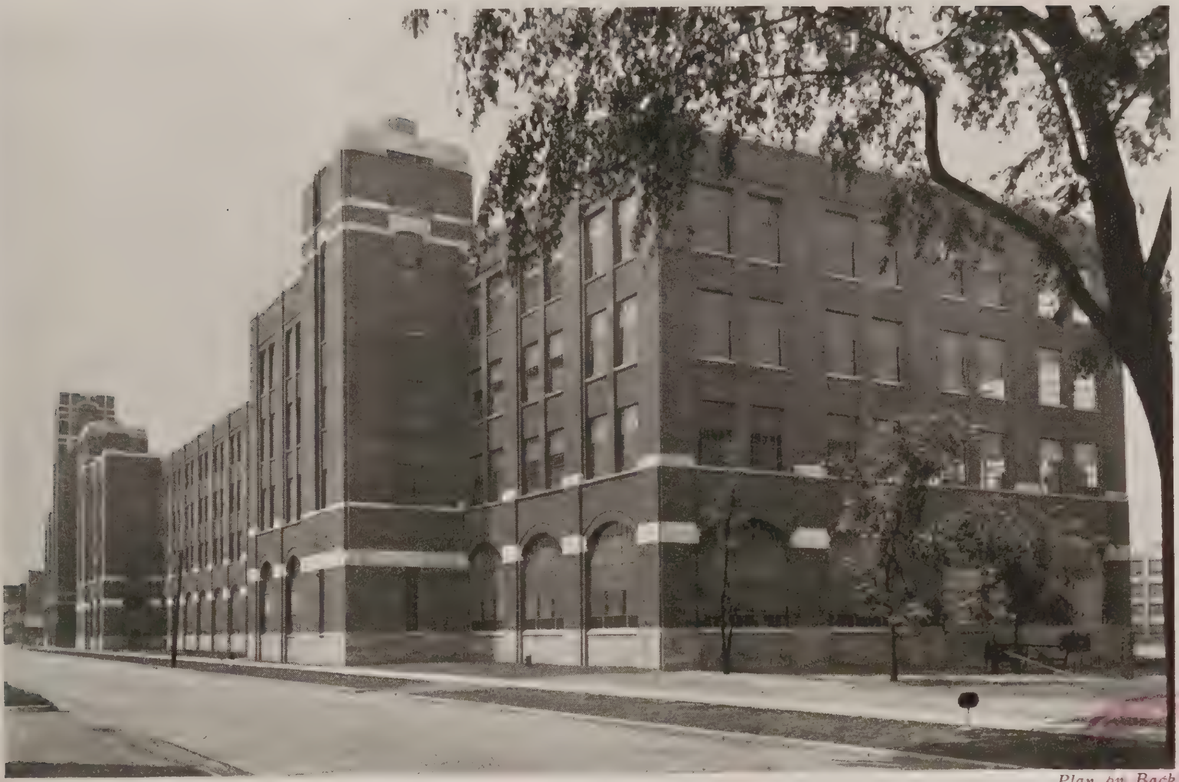


Photo. Thomas Ellison

Plan on Back

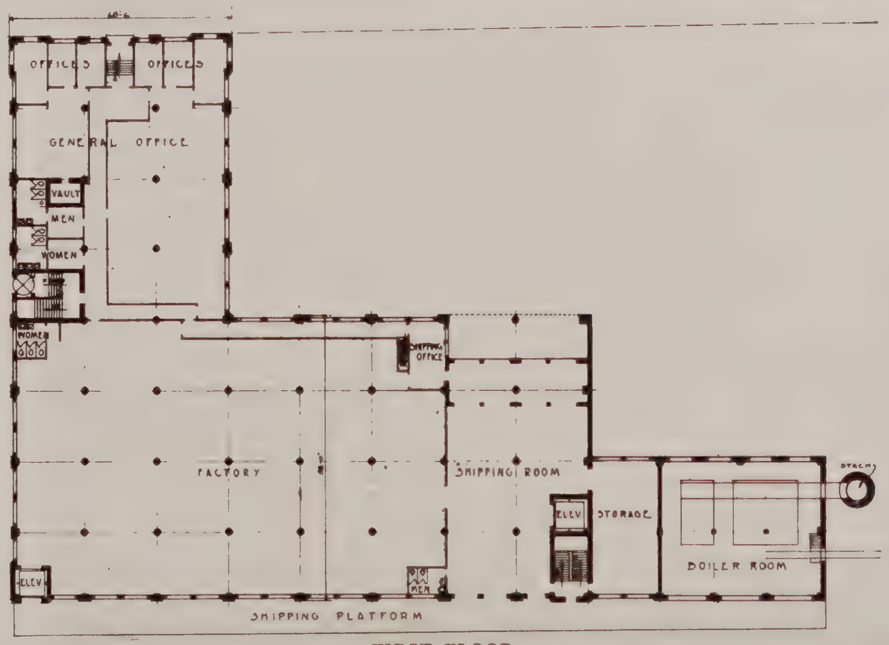
BUILDING FOR AMERICAN SEATING COMPANY, GRAND RAPIDS
SMITH, HINCHMAN & GRYLLS, ARCHITECTS

Plan on Back

BUILDING FOR WILLIAMSON CANDY COMPANY, CHICAGO
CHATTEN & HAMMOND, ARCHITECTS

CONSTRUCTION DATA

Year of Completion: 1927.
Type of Construction: Reinforced concrete.
Exterior Materials: Brick and artificial stone.
Interior Materials: Brick and exposed concrete.
Floors: First floor, creosoted wood block; other floors, cement.
Windows: Standard steel side wall sash and reversible sash, depending on location.
Lighting: Direct.
Heating: Shop section of first and second floors, unit heaters; balance direct radiation.
Use of Building: Wood working and finishing plant.



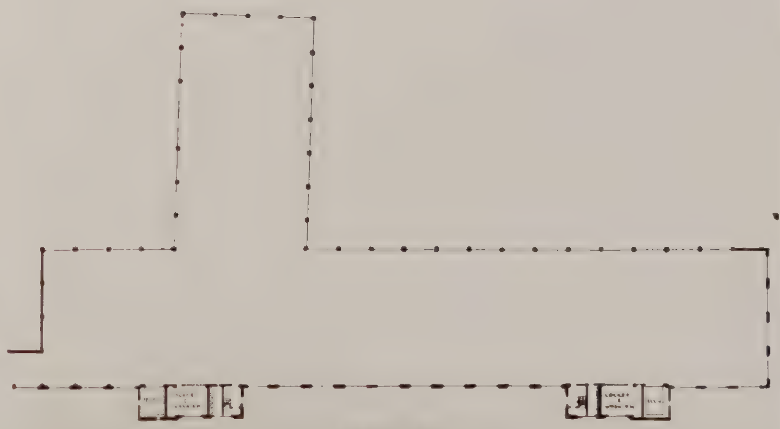
FIRST FLOOR

PLAN. BUILDING FOR WILLIAMSON CANDY CO., CHICAGO

CHATTEN & HAMMOND, ARCHITECTS

COST AND CONSTRUCTION DATA

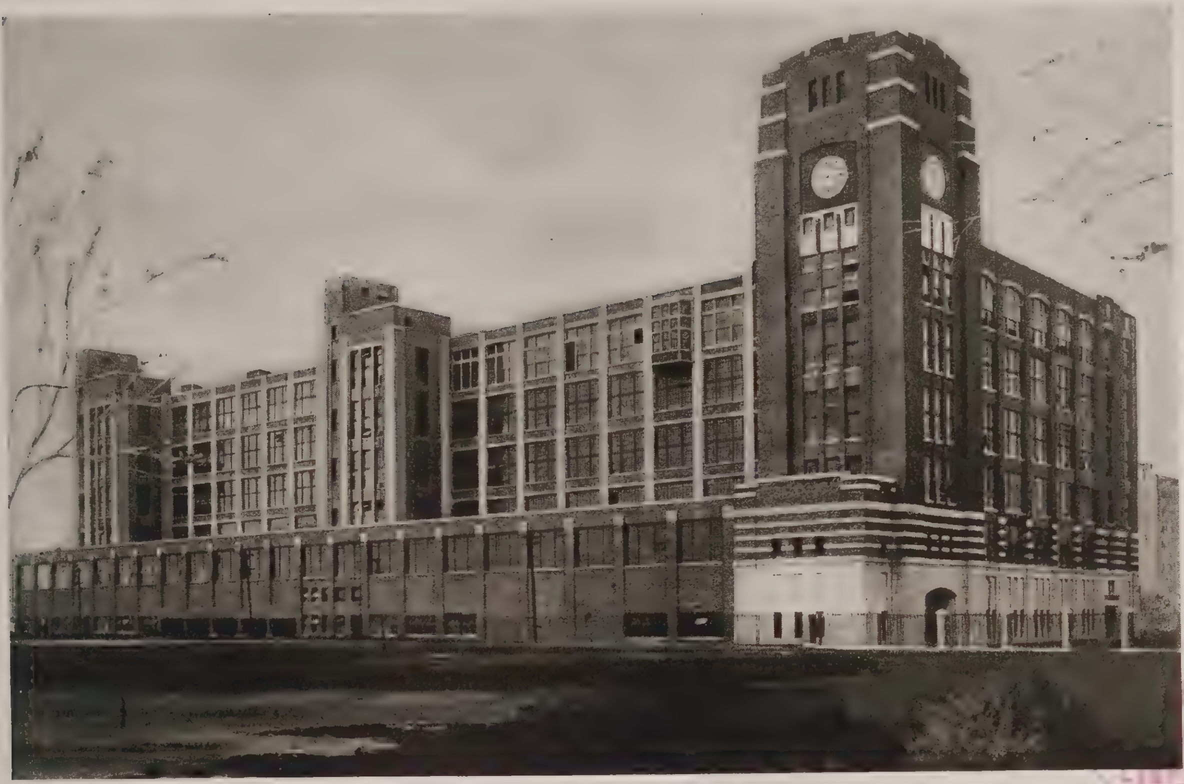
Year of Completion: 1924.
Type of Construction: Fireproof flat slab.
Exterior Materials: Face brick and terra cotta trim.
Floors: Cement.
Heating: High-pressure steam plant.
Cubic Foot Cost: 36½ cents.
Total Cost: $502,000, not including architects' fee.



FIRST FLOOR

PLAN. BUILDING FOR AMERICAN SEATING CO., GRAND RAPIDS

SMITH, HINCHMAN & GRYLLS, ARCHITECTS



BUILDING FOR W. F. SCHRAFFT & SONS, BOSTON
DESIGNED BY LOCKWOOD GREENE ENGINEERS, INC.

Photo. Manning Bros.

BUILDING FOR U. S. RUBBER CO., MORGAN & WRIGHT DIVISION, DETROIT
DESIGNED BY LOCKWOOD GREENE ENGINEERS, INC.

CONSTRUCTION DATA

Year of Completion: 1925.
Type of Construction: Reinforced concrete.
Exterior Materials: Face brick, limestone, tile.
Interior Materials: Concrete.
Floors: Concrete, wood, tile.
Windows: Steel.
Lighting: Electricity.
Heating: C I Radiator and carrier system.
Ventilating: Carrier system.
Use of Building: Candy factory.

ABOVE. BUILDING FOR W. F. SCHRAFFT & SONS, BOSTON
DESIGNED BY LOCKWOOD GREENE ENGINEERS, INC.

CONSTRUCTION DATA

Year of Completion: 1920.
Type of Construction: Reinforced concrete, brick veneer.
Exterior Materials: Face brick, art stone.
Interior Materials: Reinforced concrete.
Floors: Concrete.
Windows: Steel.
Lighting: Electricity.
Heating: C I Radiator.
Use of Building: Factory and Warehouse.

BUILDING FOR U. S. RUBBER CO.,
MORGAN & WRIGHT DIVISION, DETROIT
DESIGNED BY LOCKWOOD GREENE ENGINEERS, INC.

THE EXTERIORS OF INDUSTRIAL BUILDINGS

BY

J. P. H. PERRY

VICE-PRESIDENT, TURNER CONSTRUCTION COMPANY

INDUSTRIAL buildings in America, so far as their types of construction go, may be divided into three classes,—"mill construction," "structural steel," and "reinforced concrete." Nearly all mill construction buildings have brick walls. Structural steel industrial buildings usually have their exteriors of brick or a combination of brick and some other material such as stone, terra cotta or cast stone, though on the Pacific coast and in the southwest the current practice seems to be to occasionally use reinforced concrete exterior walls instead of brick, and there are other instances in the country where, perhaps to break a bricklayers' strike, concrete has been used for the walls. Reinforced concrete industrial buildings have their exterior walls usually of four types: (a) all concrete, (b) all brick, (c) all terra cotta or stone, (d) a combination of concrete and brick, stone, terra cotta or cast stone.

The architectural treatment of the exteriors of industrial buildings of the mill construction or the structural steel type of construction is generally studied from a point of view not materially dissimilar to that in mind when commercial buildings are being designed. On the other hand, the problem of how to treat the walls of a reinforced concrete factory or warehouse has not yet been solved to a point where there has been any general adoption of a standard method. It was only a little over 30 years ago that the first reinforced concrete industrial building was built in America,—the Pacific Coast Borax Company's four-story factory at Bayonne. Hardly a generation thus has passed since that pioneer structure was erected, and yet today we find reinforced concrete very generally accepted as the leading structural material for industrial buildings. While the merit of reinforced concrete as a structural material is fully admitted, it is a fact that in the minds of many architects the term "concrete building" brings up a picture of concrete exterior walls. In many instances the inappropriateness of such exterior treatment eliminates the concrete type from further consideration, and fireproofed steel is adopted as a structural material, whereas money would have been saved and at least an equally good if not a better building would have been designed had reinforced concrete been used for the skeleton frame, and the problem of how to design the exterior approached in a manner identical to that which would have prevailed had steel or even mill construction been adopted. The architect would often save real money for his client and gain many advantages for his building if he could establish in his mind clearly the absolute interchangeability of the terms "structural steel" and "structural concrete." There are thousands of fine factories and warehouses with brick, terra cotta or cast stone exterior walls whose skeleton frames and interior construction are of reinforced concrete. These buildings are just as truly "concrete buildings" as though they had been given concrete exterior treatment.

It will probably be generally granted that the exteriors of the early all-concrete factories or warehouses were not very pleasing, and no argument would be made with the statement that their concrete walls, so far as appearance goes, have not worn very well. Some of the present unsightliness of the early buildings can be accounted for by faults of design and construction which are now eliminated in well built concrete structures. In very early buildings reinforcing rods were placed too close to the surface, with consequent rusting of the reinforcement followed by spalling of the concrete. Form work has been greatly improved in the last 25 years. Methods of treating concrete surfaces are now not only better understood but more dependable. The early designers using concrete failed to regard the new material as worthy of original treatment. Instead, every effort was used to make concrete resemble stone by using heavy rustication or quoin markings. Some of the modern concrete buildings, such for example as the splendid mail order houses of Sears, Roebuck & Company and structures such as Cass Gilbert's Army Base, point the way to the successful handling of concrete as concrete and concrete alone. The modern set-back architecture and the massing on vertical lines create an opportunity for use of concrete that it never previously enjoyed.

In spite of great improvements in design and construction of concrete exterior walls, the fact cannot be ignored that, in the east and central part of the country at least, the trend of the best architectural practice for industrial buildings is not to use concrete alone for the exterior walls. Most of the better buildings erected during the last six or eight years have been either of all brick or of brick with a combination of cast stone or terra cotta, or of a combination of brick with exposed concrete columns, or of brick with exposed concrete columns and floor beams. To verify this statement, I asked our statistical de-

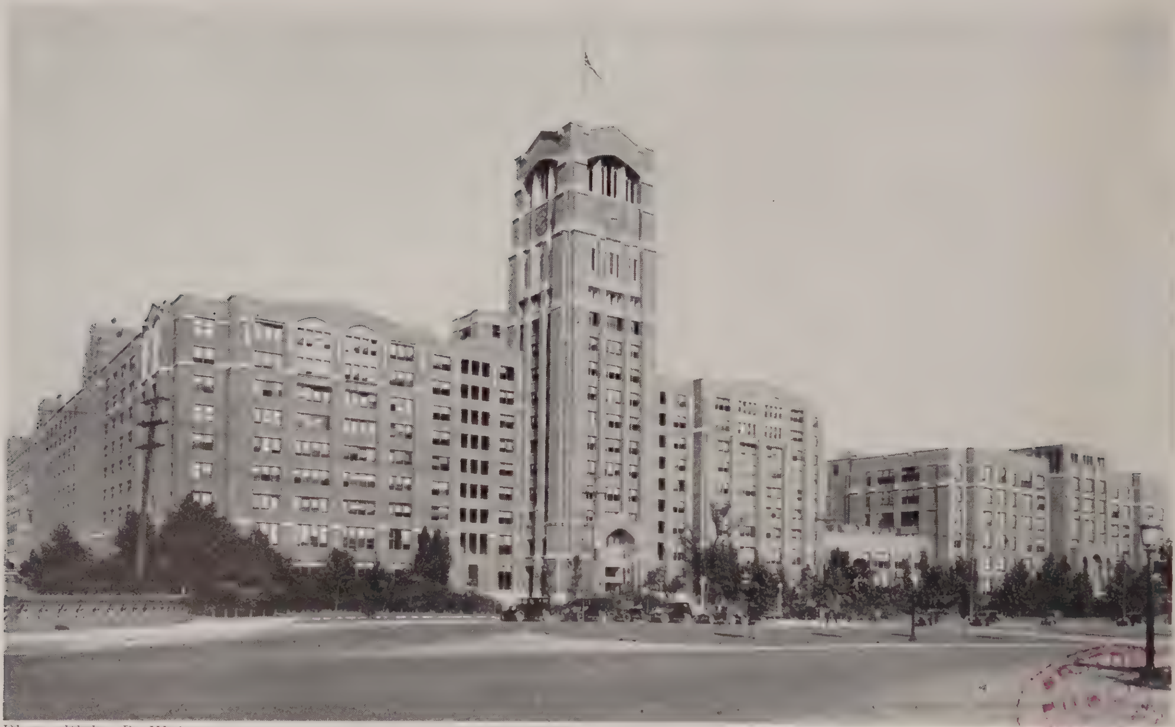
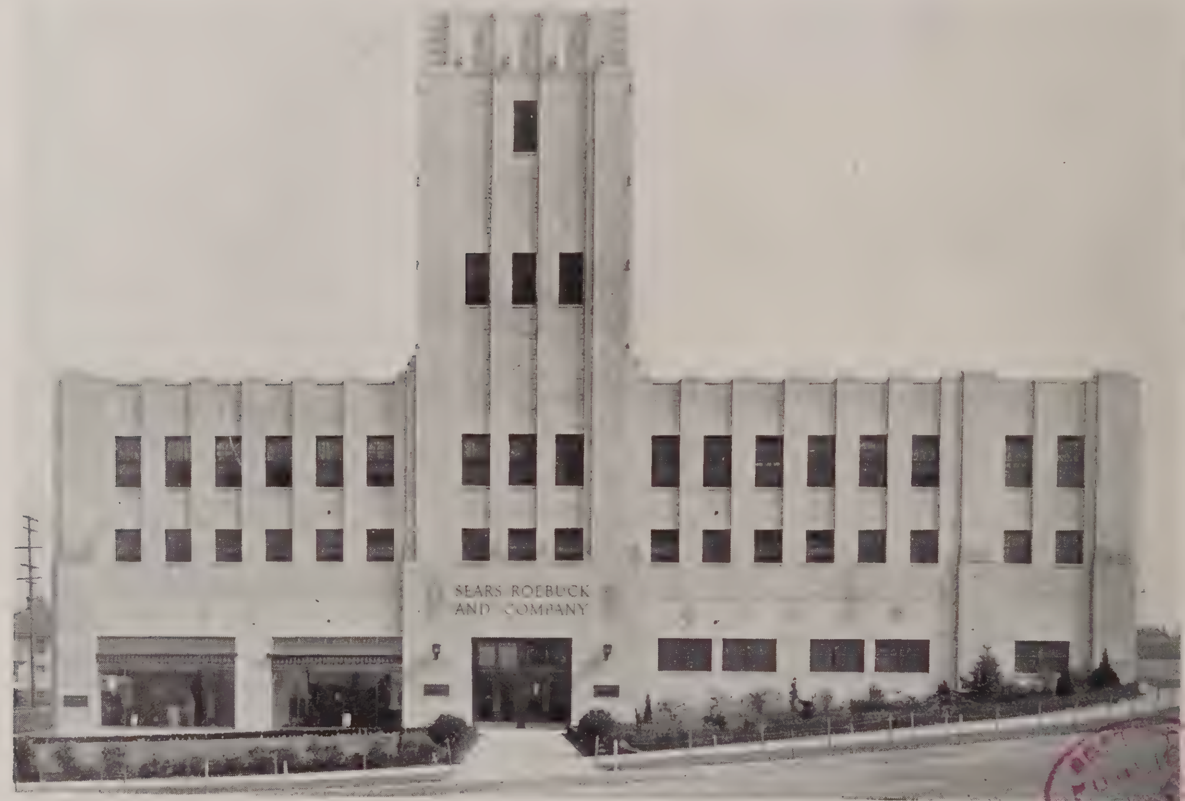


Photo. Philip B. Wallace

BUILDING FOR SEARS, ROEBUCK & COMPANY, PHILADELPHIA
NIMMONS, CARR & WRIGHT, ARCHITECTS



BUILDING FOR SEARS, ROEBUCK & COMPANY, PORTLAND, ORE.
NIMMONS, CARR & WRIGHT, ARCHITECTS

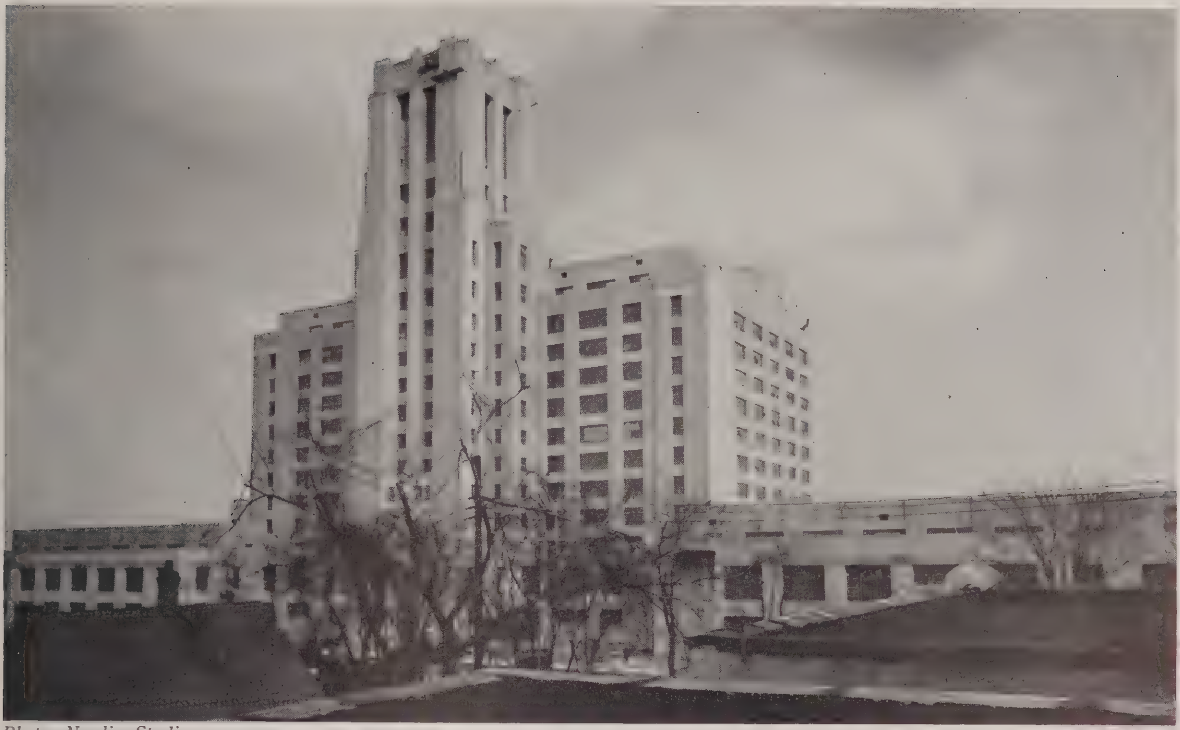
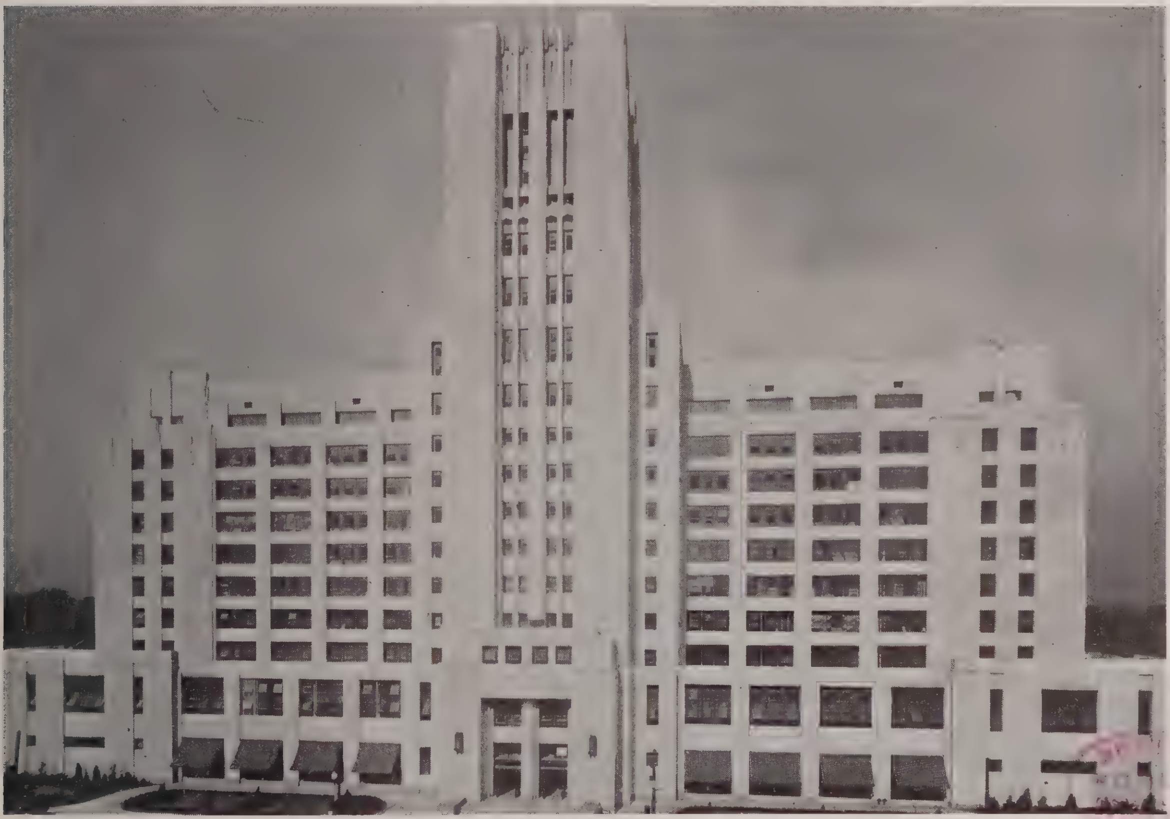
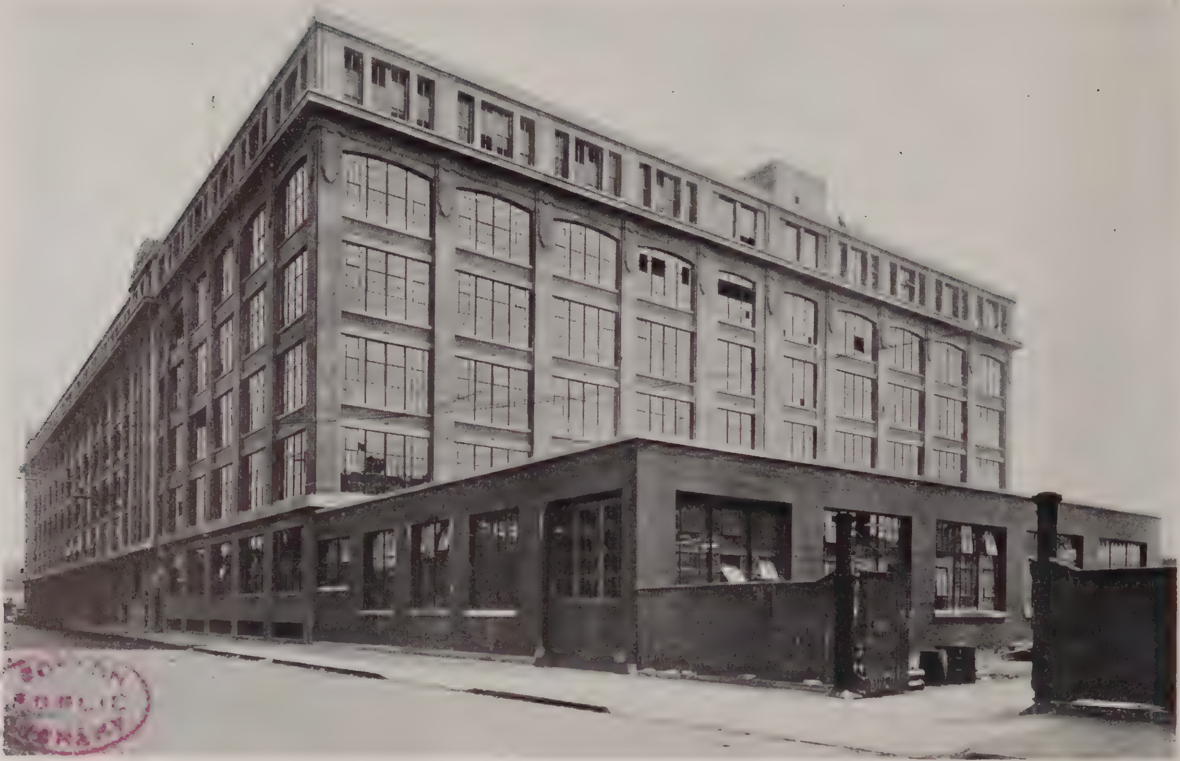


Photo. Nordin Studio

BUILDING FOR SEARS, ROEBUCK & COMPANY, MINNEAPOLIS
NIMMONS, CARR & WRIGHT, ARCHITECTS



BUILDING FOR SEARS, ROEBUCK & COMPANY, MEMPHIS
NIMMONS, CARR & WRIGHT, ARCHITECTS



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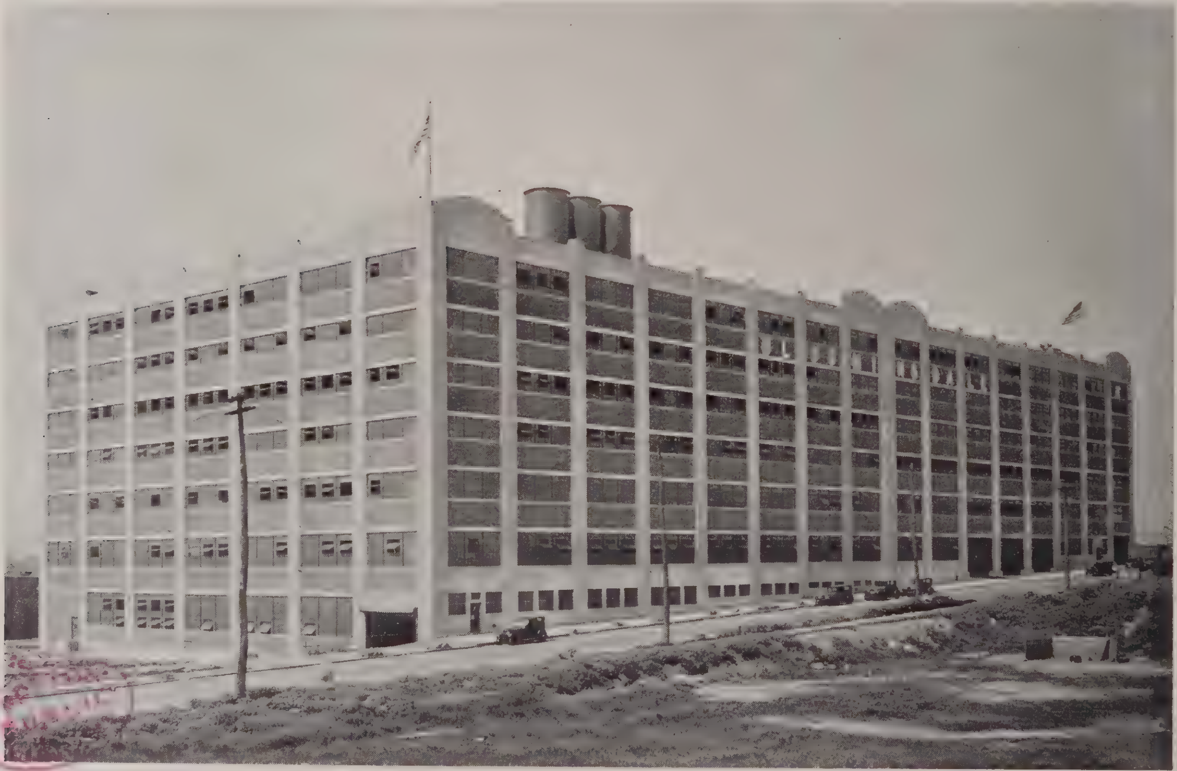
Courtesy of Turner Construction Co.

BUILDING FOR AMERICAN CAN COMPANY, BROOKLYN
CARL PREIS, ARCHITECT



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WAREHOUSE FOR BLOOMINGDALE BROTHERS, LONG ISLAND CITY, N. Y.
ABBOTT, MERKT & COMPANY, ARCHITECTS

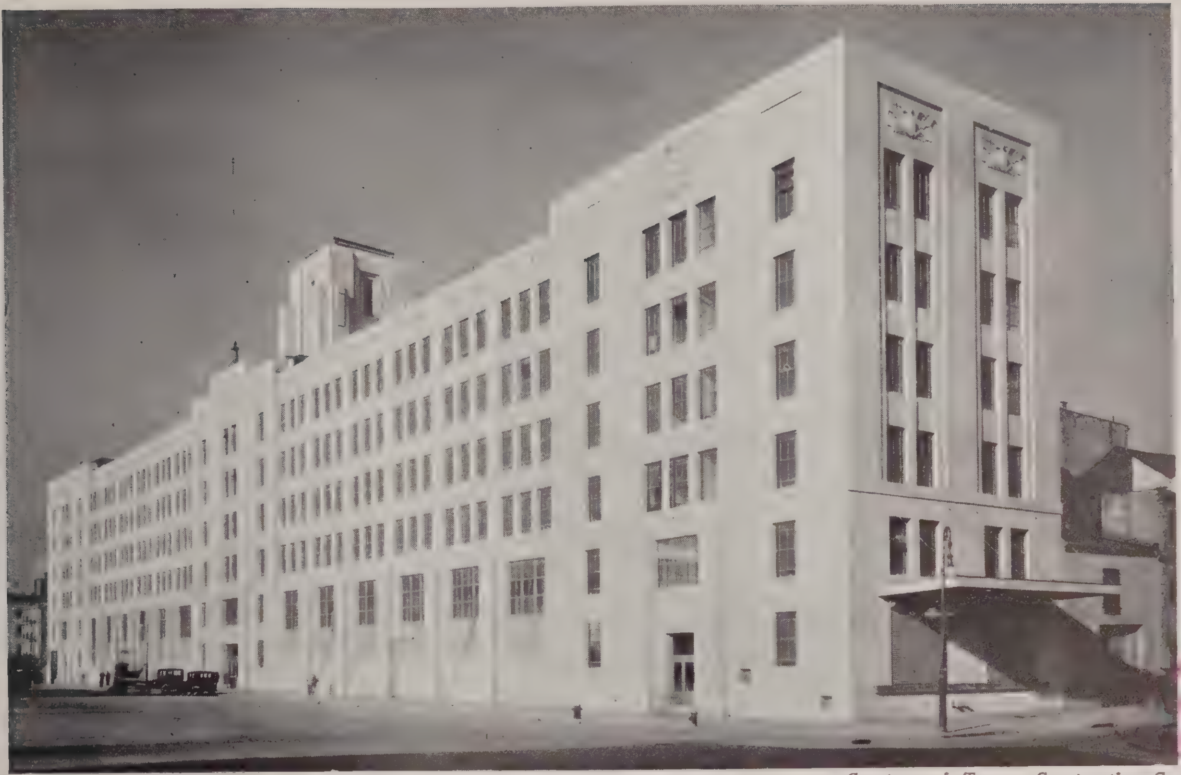

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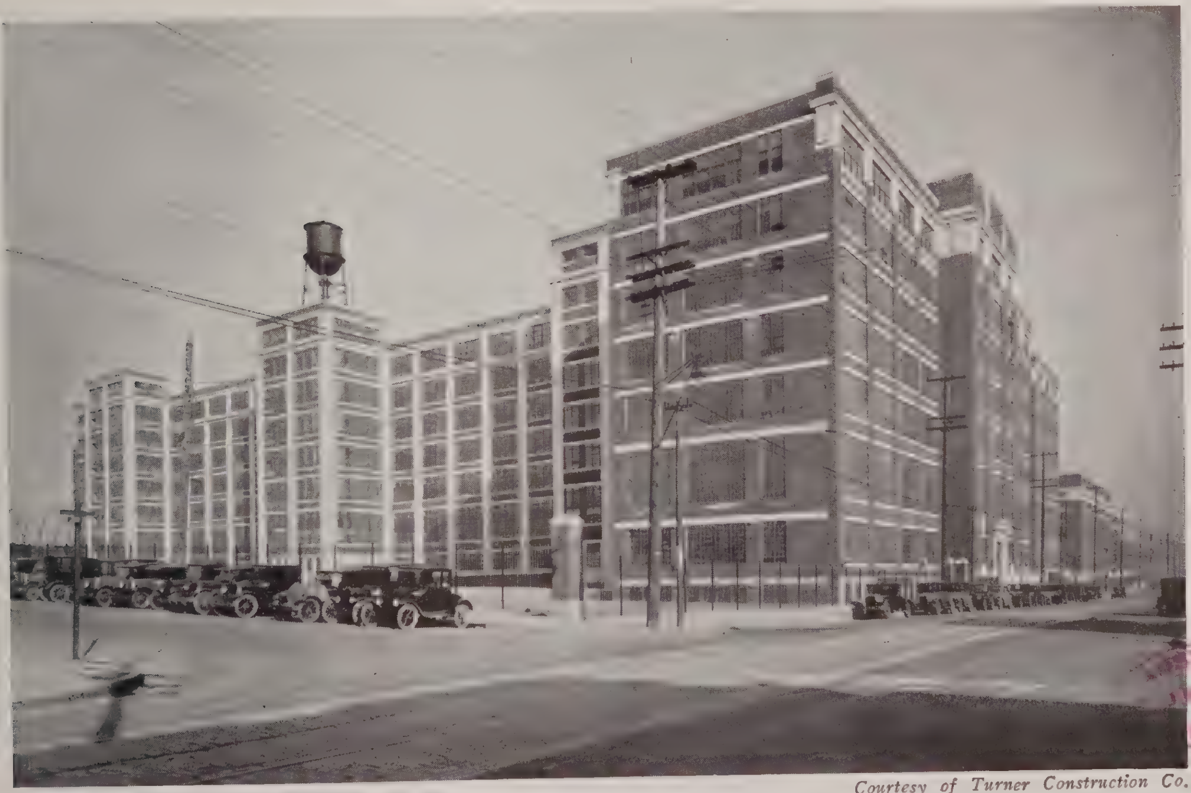
Photo. Tebbs & Knell, Inc. *Courtesy of Turner Construction Co.*

BUILDING FOR HEARST PUBLICATIONS, NEW YORK

CHARLES E. BIRGE, ARCHITECT



BOSTON PUBLIC LIBRARY

Courtesy of Turner Construction Co.

BUILDING FOR GENERAL ELECTRIC COMPANY, WEST PHILADELPHIA

HARRIS & RICHARDS, ARCHITECTS

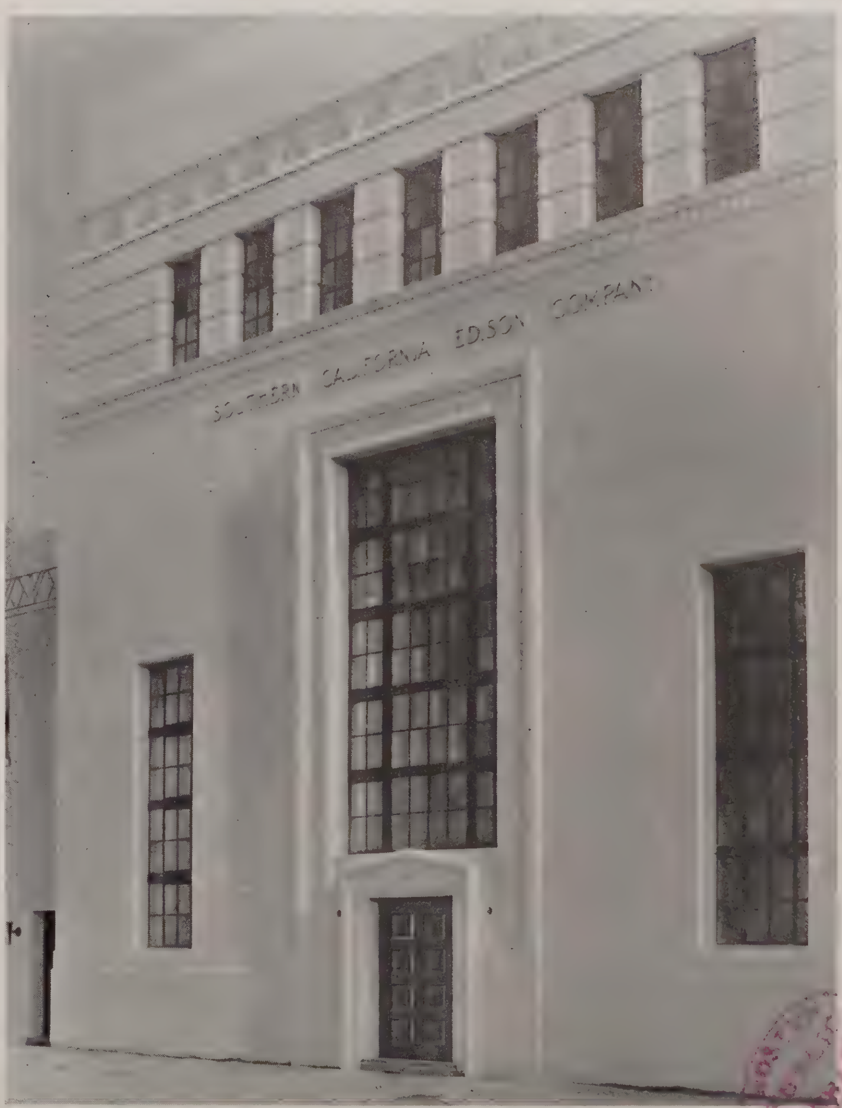


Photo. Mott Studios

SUB-STATION, SOUTHERN CALIFORNIA EDISON COMPANY

HUNT & BURNS, ARCHITECTS

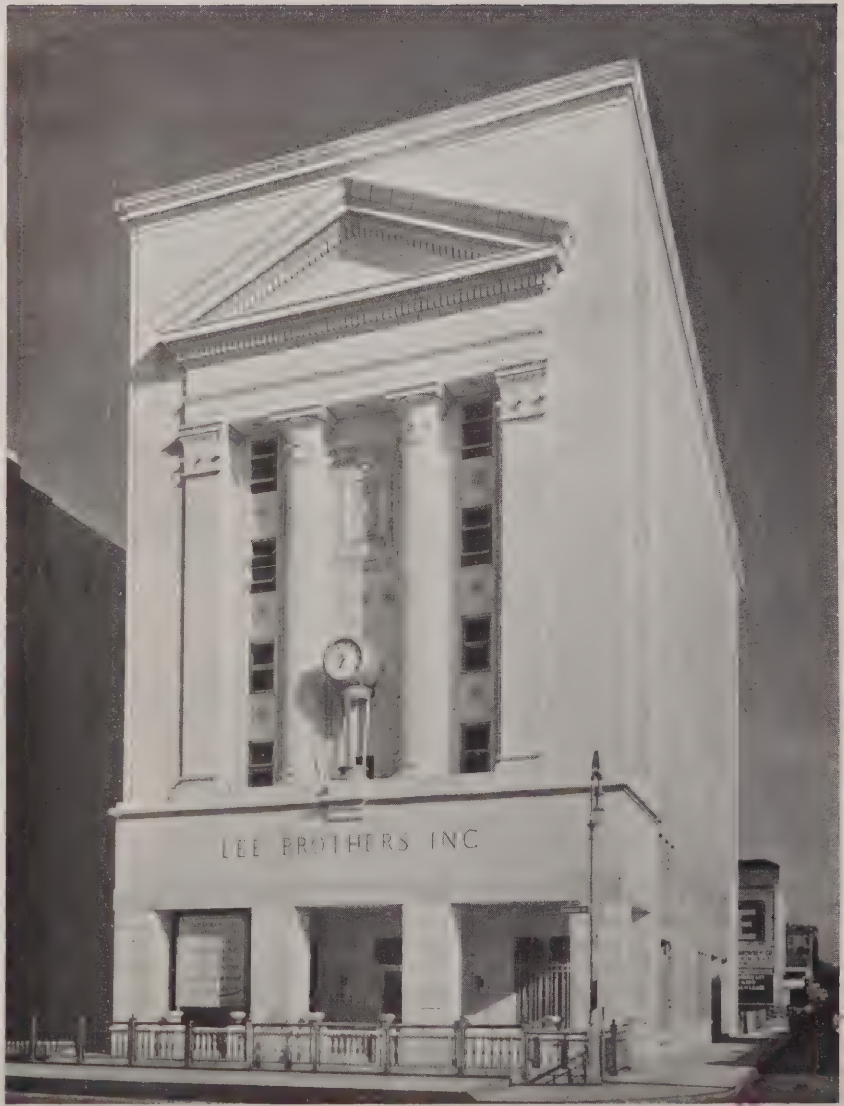


Photo. Tebbs & Knell, Inc. *Courtesy of Turner Construction Co.*

WAREHOUSE FOR LEE BROTHERS, INC., NEW YORK

KINGSLEY SERVICE, INC., ARCHITECTS

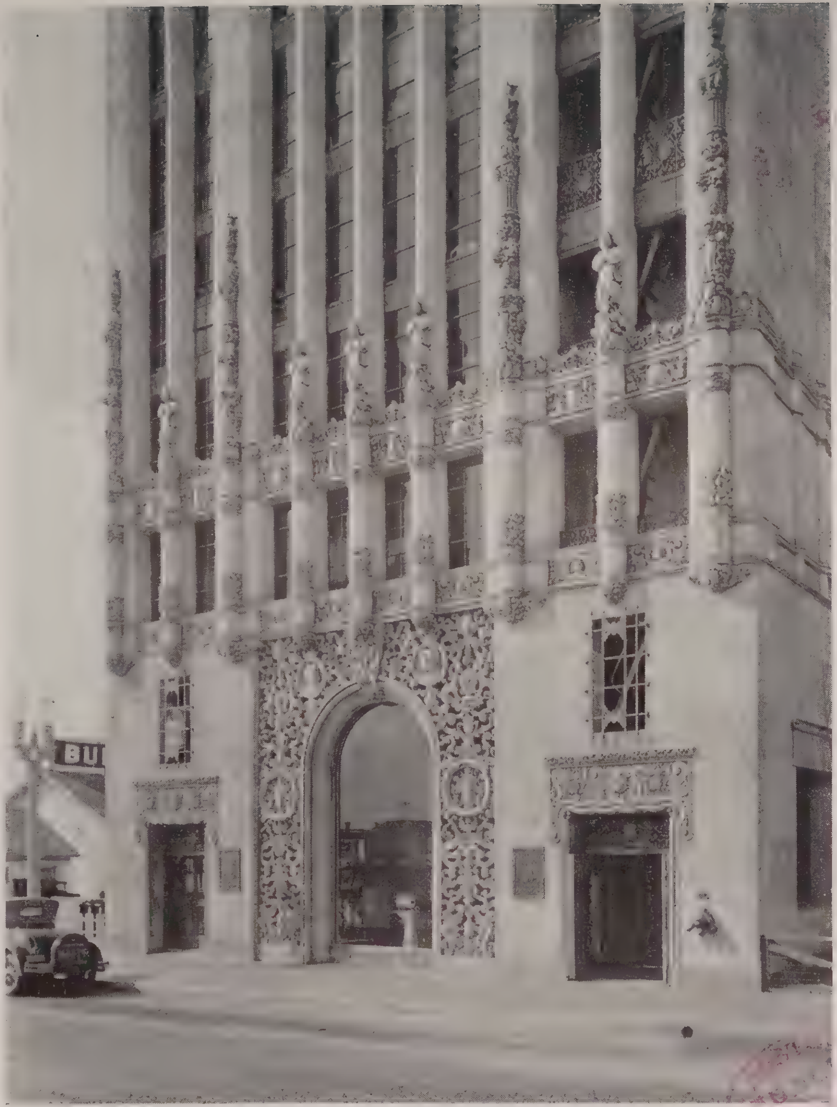
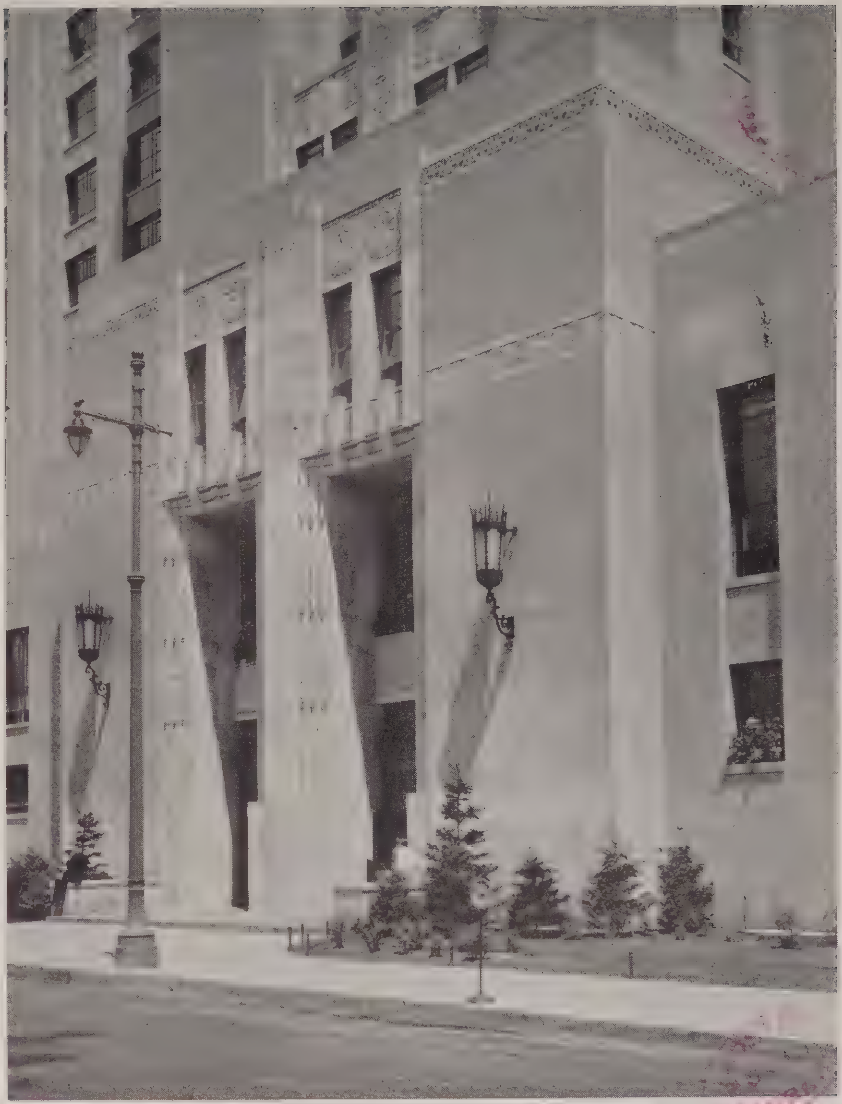


Photo. Mott Studios

MAIN ENTRANCE
HOLLYWOOD STORAGE WAREHOUSE, LOS ANGELES
MORGAN, WALLS & CLEMENTS, ARCHITECTS



MAIN ENTRANCE
BUILDING FOR SEARS, ROEBUCK & COMPANY, MINNEAPOLIS
NIMMONS, CARR & WRIGHT, ARCHITECTS

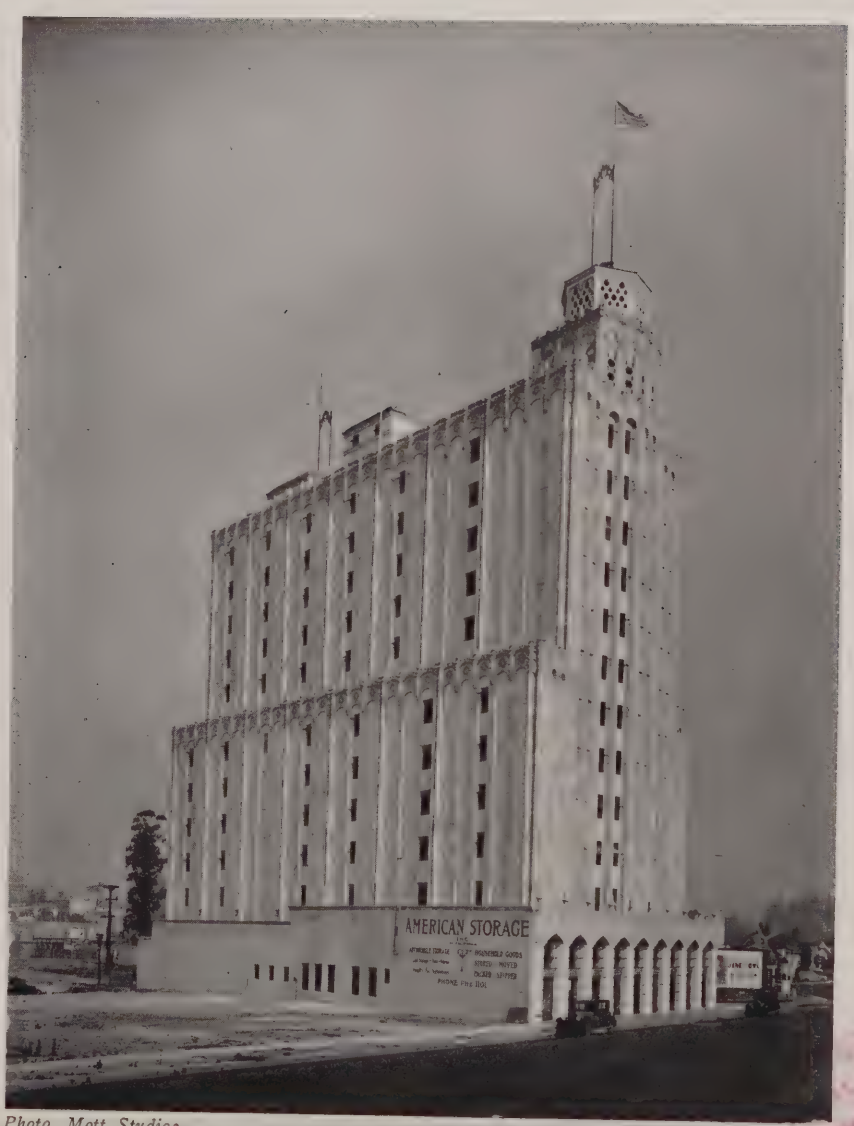


Photo. Mott Studios

AMERICAN STORAGE WAREHOUSE, LOS ANGELES
ARTHUR E. HARVEY, ARCHITECT

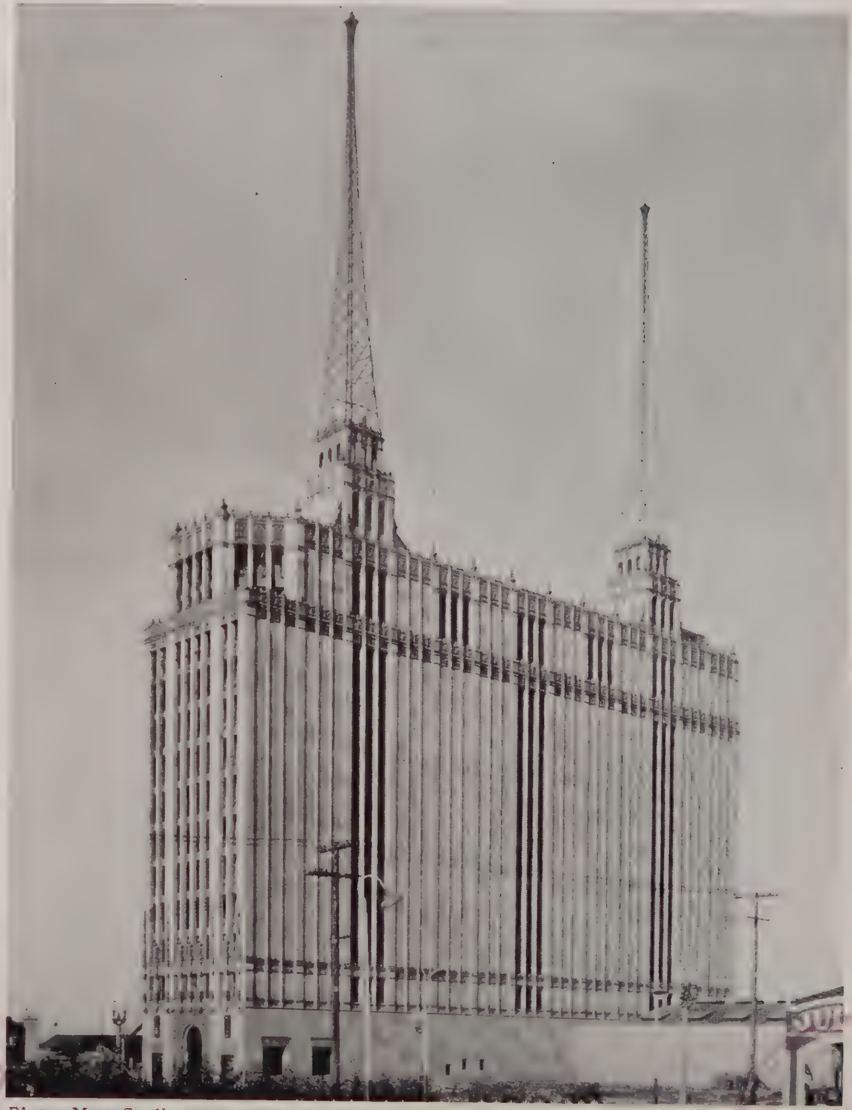


Photo. Mott Studios

HOLLYWOOD STORAGE WAREHOUSE, LOS ANGELES
MORGAN, WALLS & CLEMENTS, ARCHITECTS

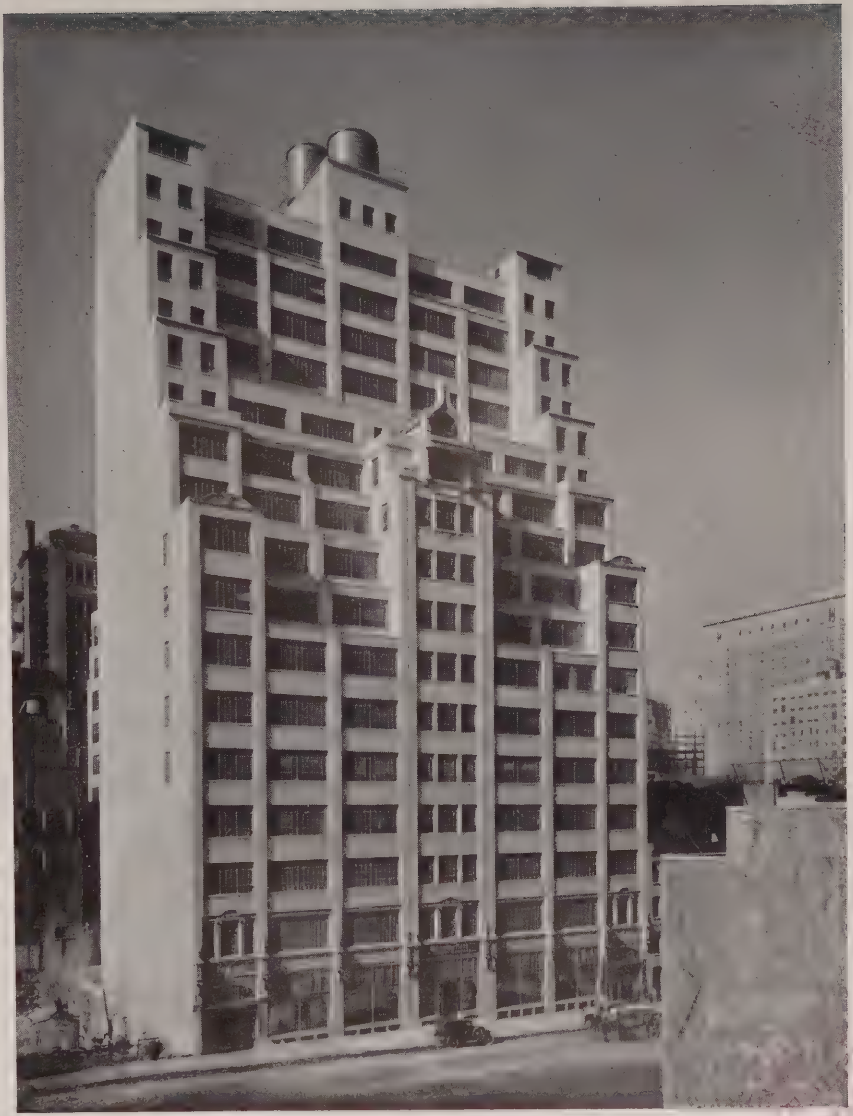
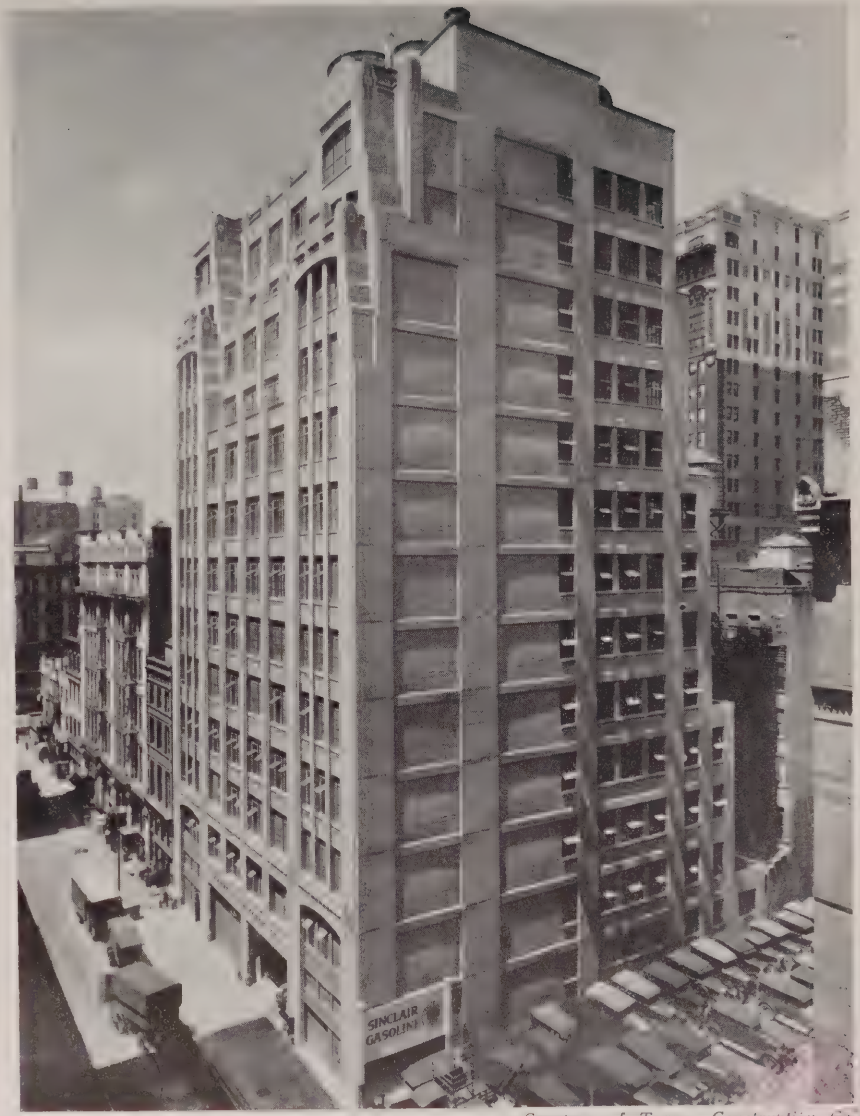


Photo. Tebbs & Knell, Inc. Courtesy of Turner Construction Co.

LOFT BUILDING ON EAST FORTY-FIFTH STREET, NEW YORK

OTTO STRACK, ARCHITECT



Courtesy of Turner Construction Co.

BUILDING FOR F. G. SHATTUCK COMPANY, NEW YORK

RUSSELL G. CORY, ARCHITECT

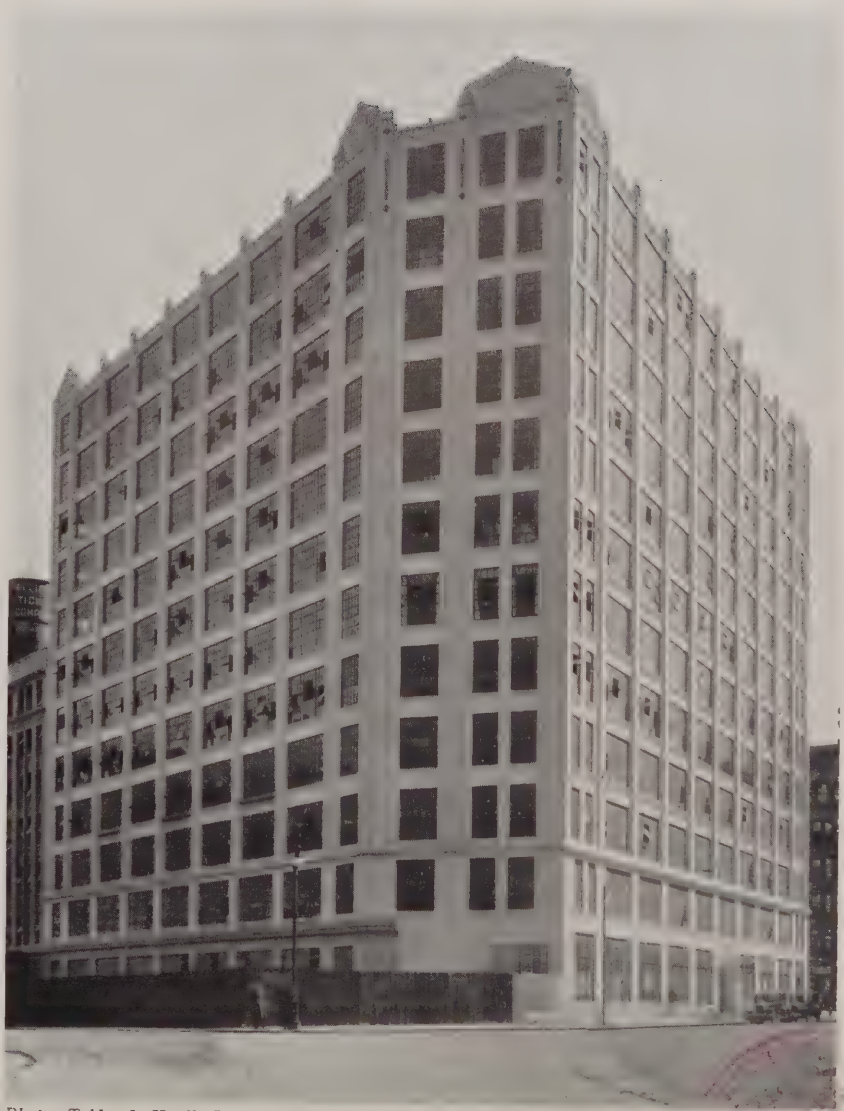
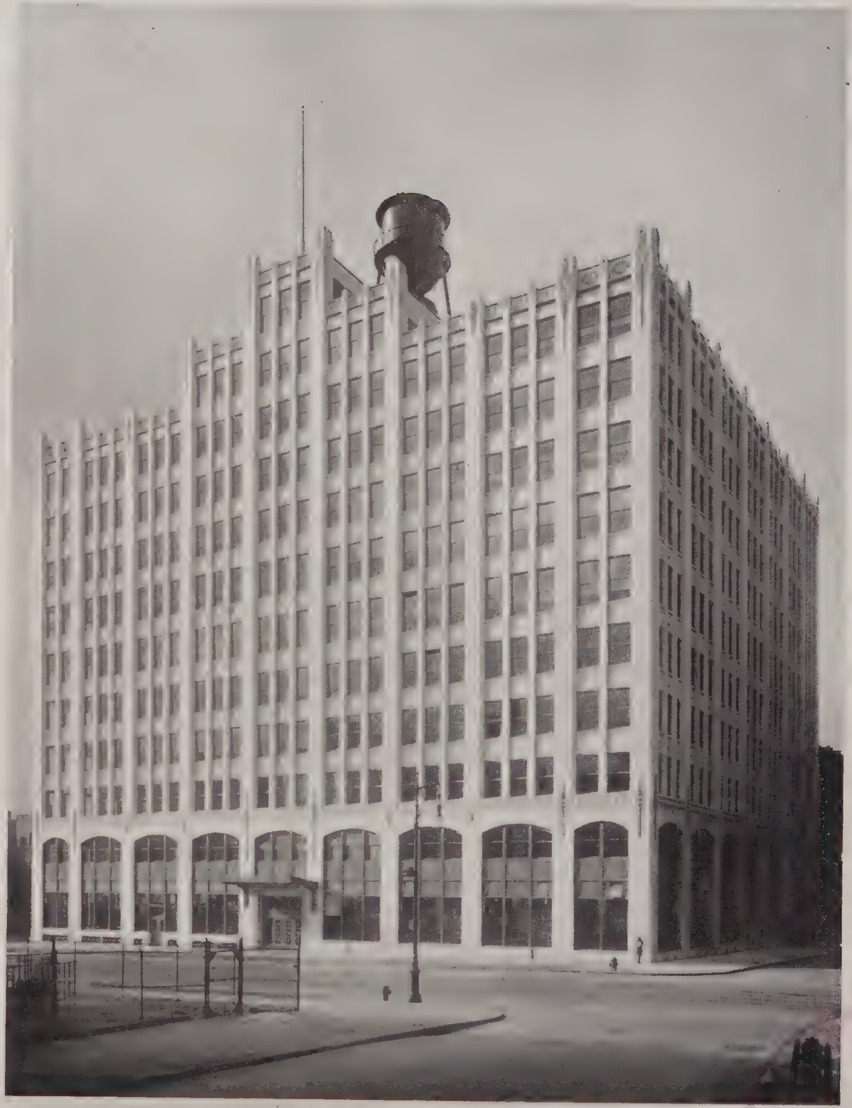


Photo. Tebbs & Knell, Inc. *Courtesy of Turner Construction Co.*

GREEN TERMINAL BUILDING, NEW YORK

RENWICK, ASPINWALL & GUARD, ARCHITECTS



Courtesy of Turner Construction Co.

BUILDING FOR AMERICAN NEWS COMPANY, NEW YORK

RUSSELL G. CORY, ARCHITECT

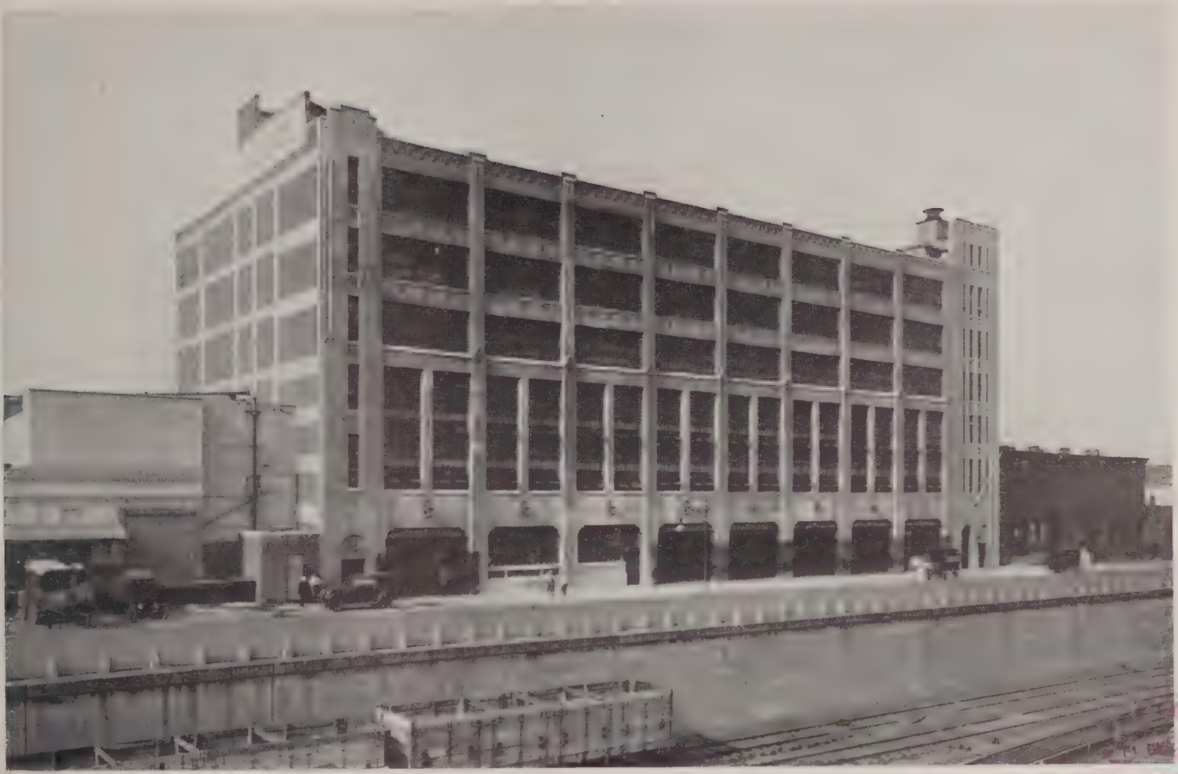


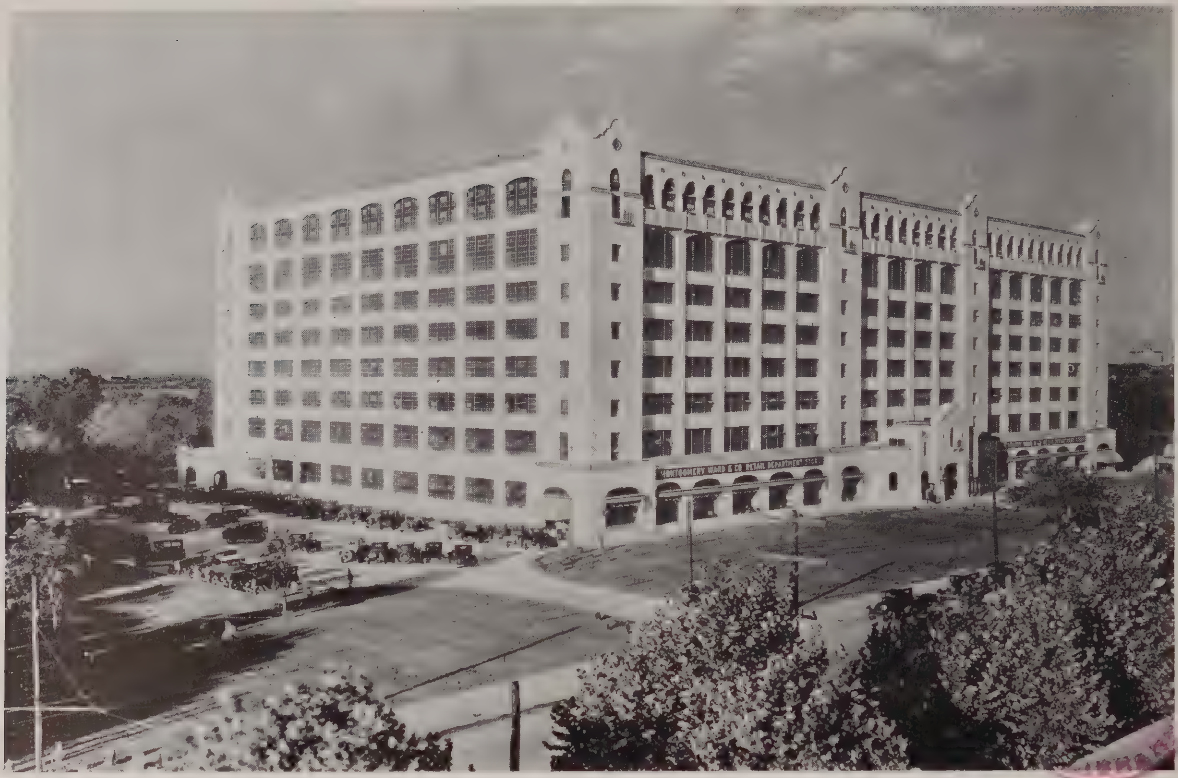
Photo. Edwin Levick

Daily News Building, Brooklyn
Designed by Lockwood Greene Engineers, Inc.

partment to make a study of 1,015 industrial buildings built by our Company during the past 27½ years. During the first 16 years (prior to 1918) 57 per cent of these factories and warehouses had their walls of all concrete. From 1918 to 1923, inclusive, 43 per cent of such buildings had their exteriors of all concrete, and in the six years from 1924 to 1929, inclusive, only 30 per cent of such structures had all-concrete exteriors. A further indication that the all-concrete exterior is not as generally used as it used to be is found by studying the work of such leading industrial architects as Nimmons, Carr & Wright, A. S. Alschuler, and S. Scott Joy in Chicago; Albert Kahn in Detroit; Monks & Johnson in Boston; Lockwood, Greene & Company, Frank S. Parker, Buchman & Kahn, and Russell G. Cory in New York. Such a study will indicate that the majority of their buildings have their exteriors rarely all of concrete. A further indication of this trend is seen in the designs adopted by some of the great industrial concerns of America. Among others there may be mentioned: The General Electric Company; Sears, Roebuck & Company; Western Electric Company; Ford Motor Company; National Biscuit Company; American Telephone & Telegraph Company and its many subsidiaries; Packard Motor Car Company,—in fact the automobile industry in general has swung away from the use of the all-concrete exterior for its great manufacturing plants scattered over the country.

In Chicago, where concrete is used for building construction probably as widely if not more so than in any city in the country, it is very rarely that one sees an all-concrete exterior. The Central Manufacturing District, containing one of the finest groups of industrial buildings in America, has adopted a very pleasing exterior treatment of brick with ornament of terra cotta or stone. Perhaps the only locality where the all-concrete exterior is not declining in popularity is in the southwest, and particularly in California, where buildings with concrete walls are being increasingly built and very satisfactorily so,—as is evidenced by such outstanding structures as Sears, Roebuck & Company's mail order house in Los Angeles; Montgomery Ward & Company's great buildings in Fort Worth and in Oakland; and the Hollywood Terminal and the American Storage Buildings in Los Angeles, illustrated in this issue of The Forum.

The fundamental reason for getting away from use of all-concrete exteriors is not hard to find. In general, the primary excuse for using concrete exteriors is economy, plus the readiness with which it lends itself to being moulded in special forms and its inherent expression of sturdy strength for massive design. Industrial America has been growing richer and richer, and the



Warehouse for Montgomery, Ward & Company, Fort Worth, Texas
W. H. McCaully, Architect

American industrial executive has reached the point where he can afford to pay for what he wants. Architects, engineers and contractors have learned that brick, stone and terra cotta or combinations thereof produce a more pleasing appearance and preserve a distinguished character over a period of years much more dependably than any known type of concrete construction has yet done. The same tendency toward securing better looking buildings is seen in commercial structures all over the country,—structures such as hotels, apartment houses, office buildings, schools, bank buildings and the like. When concrete was in its infancy, such commercial structures were built largely of brick, whereas now we see limestone, terra cotta, cast stone, fine face bricks, granite, and even marble being increasingly used.

All the foregoing, however, should not be taken as meaning that the factory or warehouse with the all-concrete exterior or a combination of concrete with some other material has not still and probably always will have a substantial place in industrial building design. There are many notable examples,—some of them illustrated here,—which are extremely pleasing in design and equally satisfactory in construction. There are factories and warehouses of great magnitude built with all-concrete exteriors, such as the huge mail order houses of Montgomery Ward & Company in Albany and Baltimore; the plants of the American Can Company scattered over the country; the amazing number of fine concrete buildings in the Holland Tunnel section of New York, in Jersey City and Newark, and in Long Island City, to say nothing of the great buildings in Texas and up and down the Pacific coast. In the experience of our Company, however, certainly during the past six or eight years, we find that for every factory or warehouse with an all-concrete exterior we get a building where brick spandrel walls are used and the concrete skeleton left exposed. Some notable examples of this method of exterior treatment are the Schrafft candy factory in Charlestown, Mass.; Bloomingdale Brothers' large warehouse in Long Island City; the two 700-foot buildings of the General Electric Company at their new West Philadelphia plant; the tremendous new terminal warehouse of the D. L. & W. Railroad in Hoboken, as well as the buildings of the Great Atlantic & Pacific Tea Company and the splendid development of the American Woolen Company in Shawsheen, Mass.

If an architect selects or his client requests an all-concrete exterior treatment, there are several fairly standardized surface treatments open to his choice such as: (a) Leaving the concrete surface substantially untouched as it comes from the forms except for pointing and the correction

Warehouse for Montgomery, Ward & Company, Baltimore
W. H. McCaully, Architect

of column and beam lines and dressing of fill lines, etc. (b) Rubbing a cement grout on the surface with a float or a carborundum brick. (c) Roughing the surfaces to expose the aggregate, either by tooling or by the use of a proprietary grease painted on the forms. (d) Painting the surfaces with a proprietary coating, either colorless or to similate the color of concrete or with colored pigments to produce any shade of color desired. (e) Stuccoing with either a thin coat or a regular two-coat process. Probably the most generally adopted of these methods are the rubbing in of cement grout with a carborundum brick or the painting of the exterior and, finally, the use of stucco. The majority of the fine concrete buildings in the southwest and in California,—those of most pleasing appearance,—have a thin stucco put on the concrete. Monolithic ornamentation can be added by the use of plaster moulds. A notable example of this method of treatment is shown in the detail of the Hollywood Terminal Building on page 319. The Sears, Roebuck & Company mail order house in Los Angeles is similarly treated. Montgomery Ward & Company's mail order houses in the southwest have their all-concrete exteriors painted.

Recently there has been a distinct step forward in an effort to produce finer concrete exteriors by the lining of the forms with composition or presswood sheets or with heavy linoleum types of paper which have been produced now on a practical basis so that they do not curl when the wet concrete comes against them, are heavy enough to stand the wear and tear of construction, and are also cheap enough to still keep the cost of the concrete well below that of brick. A notable example of the successful use of this method is the new mail order house of Montgomery Ward & Company in Albany.

There is a distinct trend toward the use of colored tile inserts to relieve the monotony of an all - concrete exterior. The American News Building in New York is an example of this treatment, and the Lasher Printing Company's building in Philadelphia with its use of brick ornamentation points the way to an interesting possibility in treating all-concrete exteriors. The splendid building housing the Hearst publications on South Street, New York, designed by Charles E. Birge, is an interesting example of an all-

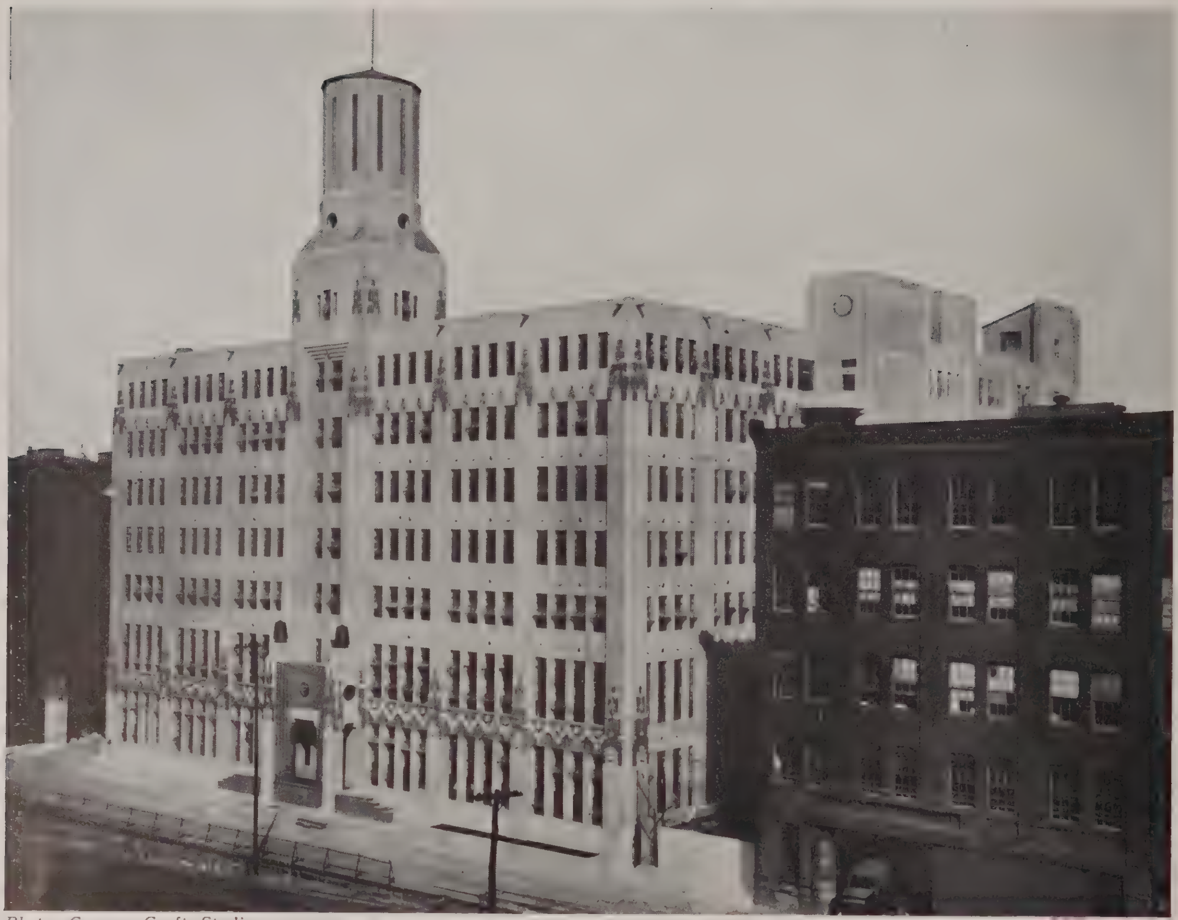


Photo. Camera Craft Studio

Building for Geo. F. Lasher Printing Company, Philadelphia

Philip S. Tyre, Architect

concrete plain exterior of simple proportions and extremely fine workmanship, producing even, true surfaces with the use of decorative panels on the parapet. The Fuller warehouse in Los Angeles is an extremely interesting example of the all-concrete building. A more conservative treatment has been adopted by the American Can Company in a number of its great plants, as witness the large factory in South Brooklyn. An unusual design was adopted by E. R. Squibb & Son for their factory in Brooklyn. A typical treatment of the concrete loft building is shown in the Green Terminal Building in the Holland Tunnel section of New York. Where large concrete structures have been built in Manhattan, the majority of them have brick exteriors, as witness the Publishers' Building on West 52nd Street, the Cadillac Building on Columbus Avenue at 63rd Street, the huge U. S. Appraisers' Stores by Buchman & Kahn, and the East 45th Street loft building. Another interesting example of all-concrete exterior for industrial buildings is Albert Kahn's new service station of the Packard Company in Manhattan with its terra cotta exterior,—also S. Scott Joy's North Station Industrial Building in Boston. Some of the most interesting industrial buildings with brick exteriors have been produced by Nimmons, Carr & Wright for Sears, Roebuck & Company, including among others the Portland retail store and the mail order houses in Philadelphia, Cambridge, Memphis and Minneapolis. Nearly all the buildings here mentioned are illustrated in this issue of THE FORUM, and as the Chinese saying goes, "a picture is worth a thousand words." Frank S. Parker in New York has designed some very large concrete factory and loft buildings running as high as 22 stories, and in general has used brick for the lower stories and then gone to exposed concrete at the tops of the buildings, his theory being that the detail defects inherent in ordinary concrete exteriors are not visible at that height and that a stone-like appearance is given with real money saving. The great Printing Crafts Building is one example, and the Graphic Arts Center in New York is another.

An architect choosing all concrete for the exterior of his building would do well to consider that he is handling a plastic material different

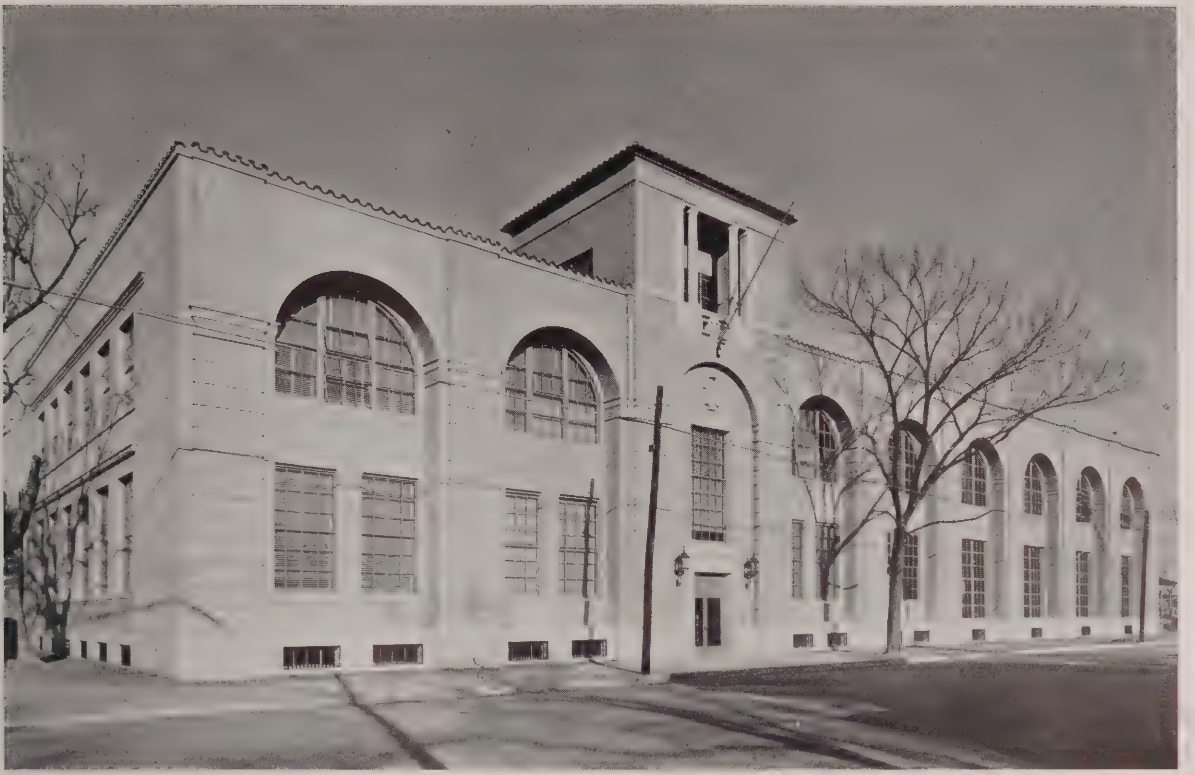


Photo. Calvin Wheat

Building for Houston Press, Houston, Tex.
Howell & Thomas, Architects

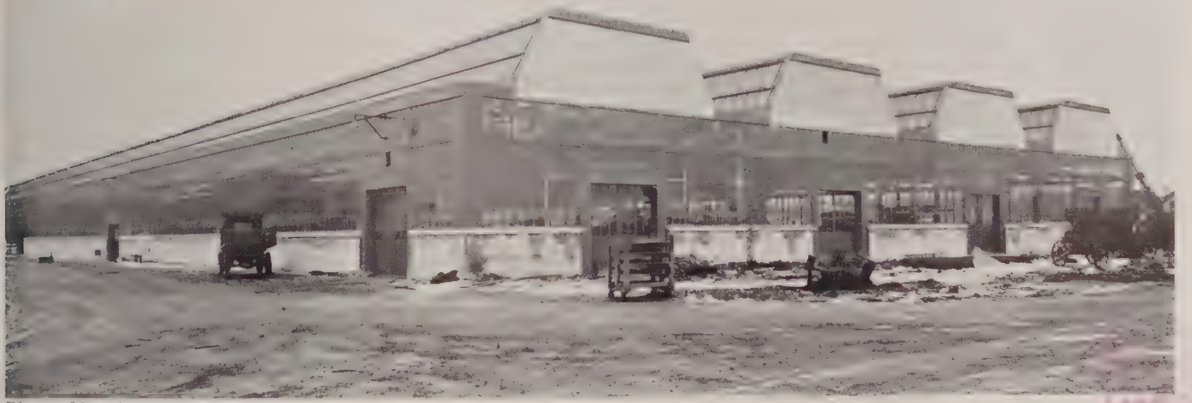


Photo. Manning Bros.

Assembly Building, the Chrysler Corporation, Detroit
Smith, Hinchman & Grylls, Architects

from any other of the past. He may find that the monolithic type is best expressed through a form which is not in complete conformity with any particular classification. Concrete structures should rely for their beauty on their sense of massive strength and immovability. They should be characterized by rectangular lines, large, unbroken wall areas, deep-set windows and massive entrance ways. Frank expression of concrete's qualities of ruggedness and strength is usually the basis of the most successful design. Long vertical lines, massive columns and graceful arches lend themselves most readily to expression in this material.

Anyone reflecting on the designing of exteriors of concrete buildings over the past 25 years cannot but get a thrill, as an American, out of the great improvement which architects have brought about in the treatment of what used to be, as the figure of speech put it, "as ugly as a factory building." Today the factories of America, in the great majority of cases, are "things of beauty."

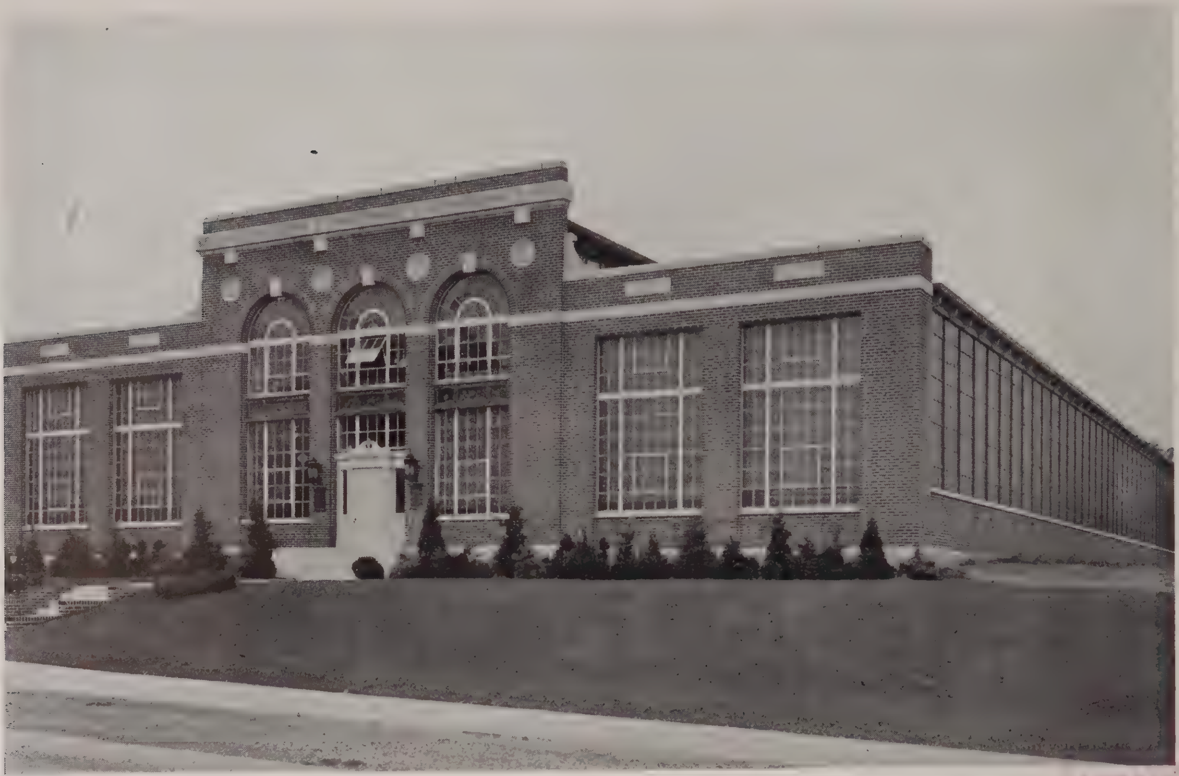


Photo. The Heller Co.

BUILDING FOR COLONIAL KNITTING MILLS, INC., PHILADELPHIA
THE AUSTIN COMPANY, ARCHITECTS

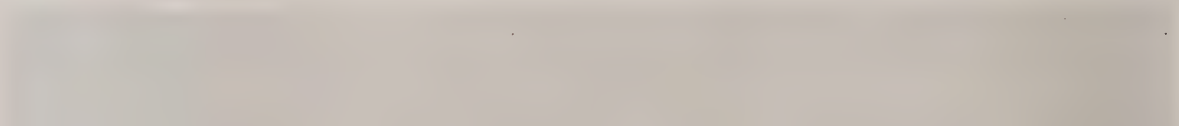
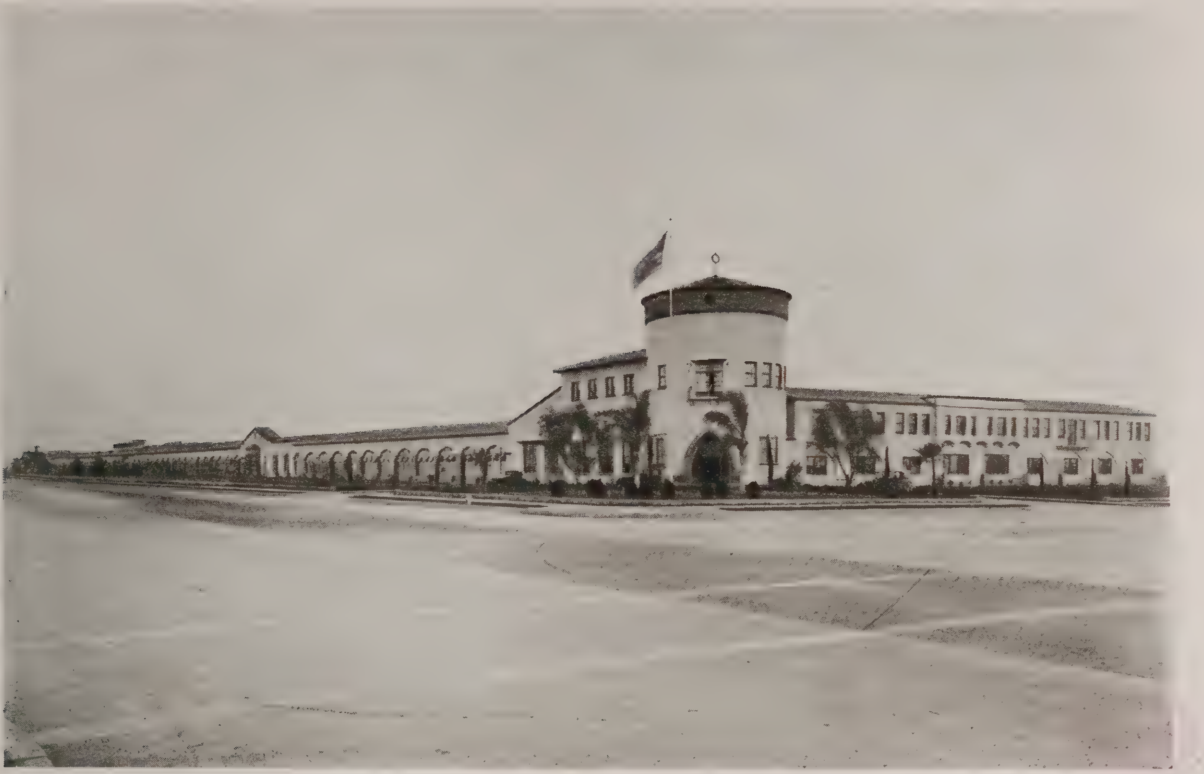
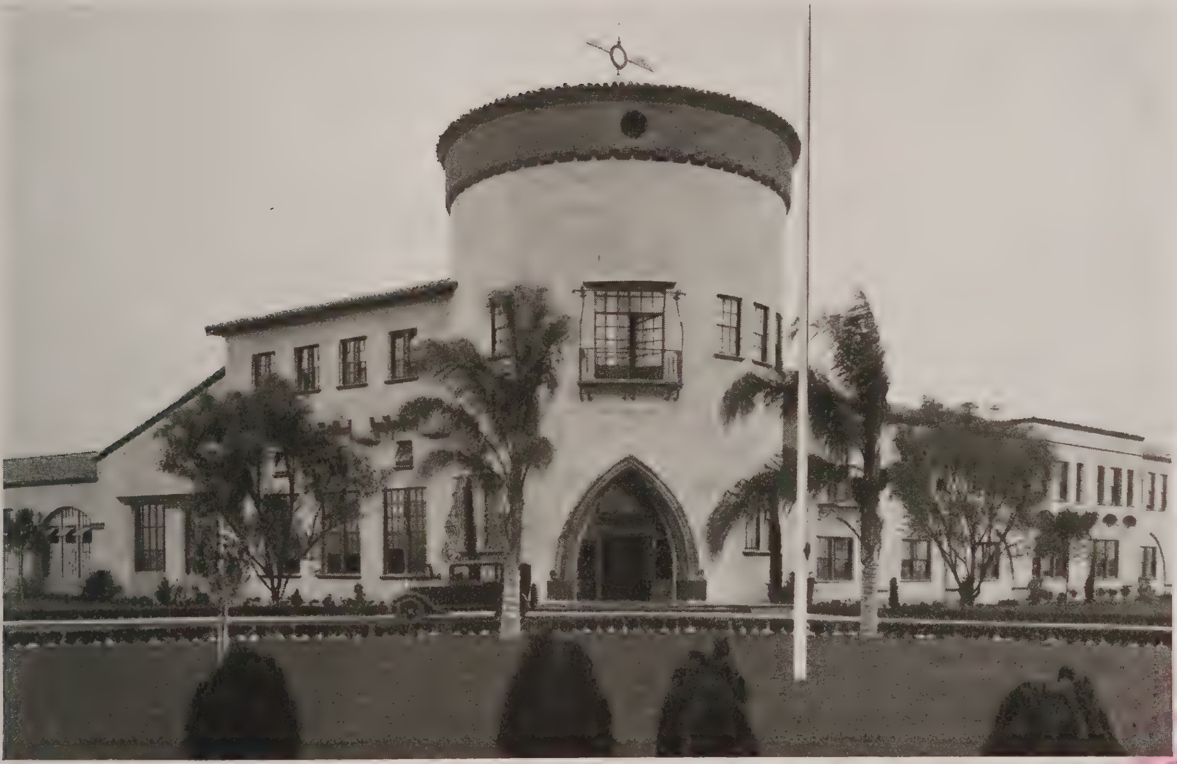


Photo. Manning Bros.

MACHINE SHOP, THE CHRYSLER CORPORATION, DETROIT
SMITH, HINCHMAN & GRYLLS, ARCHITECTS



GENERAL VIEW

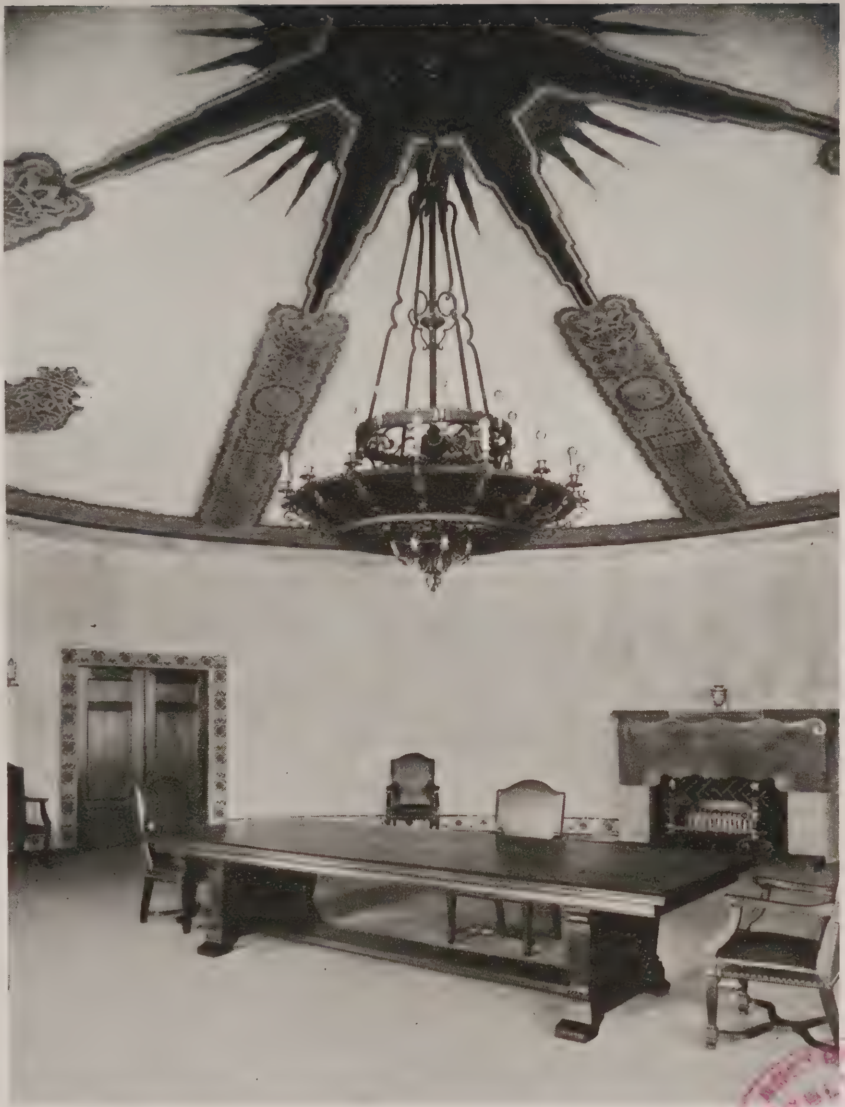


Photos. Rode-Photo

MAIN ENTRANCE

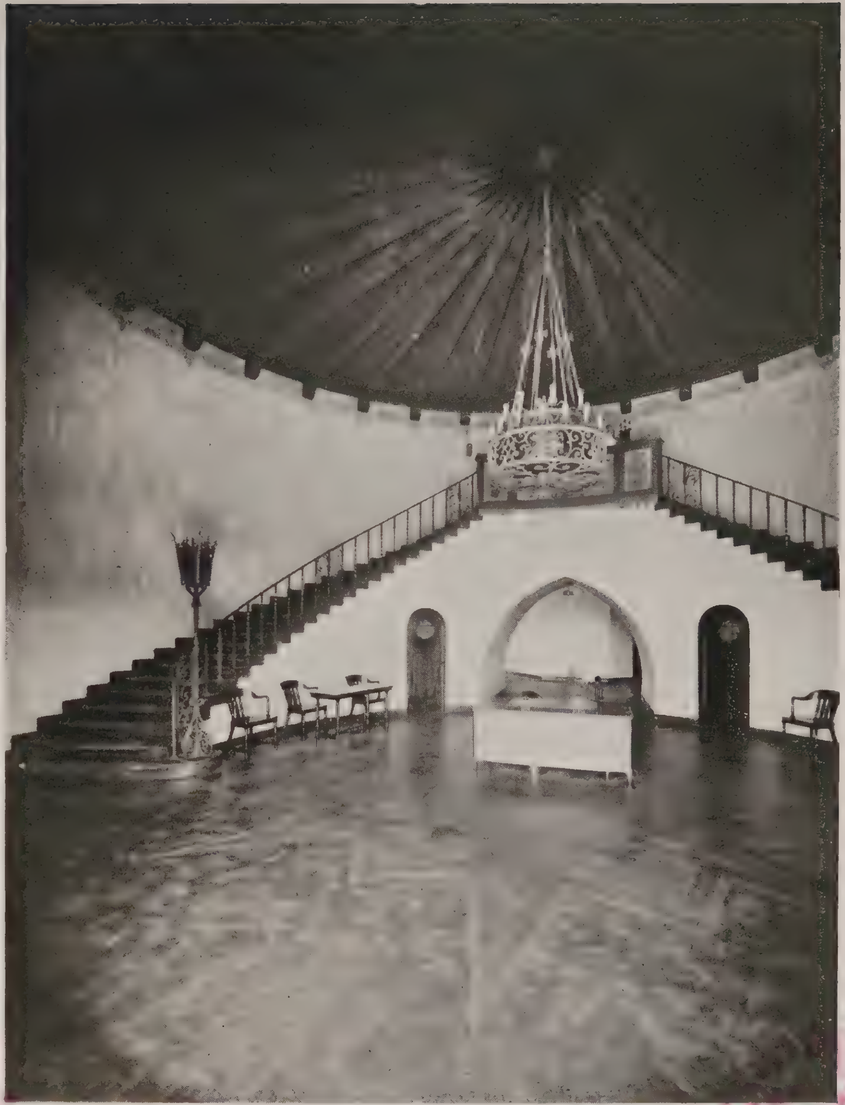
BUILDING FOR PACIFIC GOODRICH RUBBER COMPANY, LOS ANGELES

CARL JUYLES WEYL, CONSULTING ARCHITECT THE FOUNDATION COMPANY, ENGINEERS



Photos. Stagg

DIRECTORS' ROOM

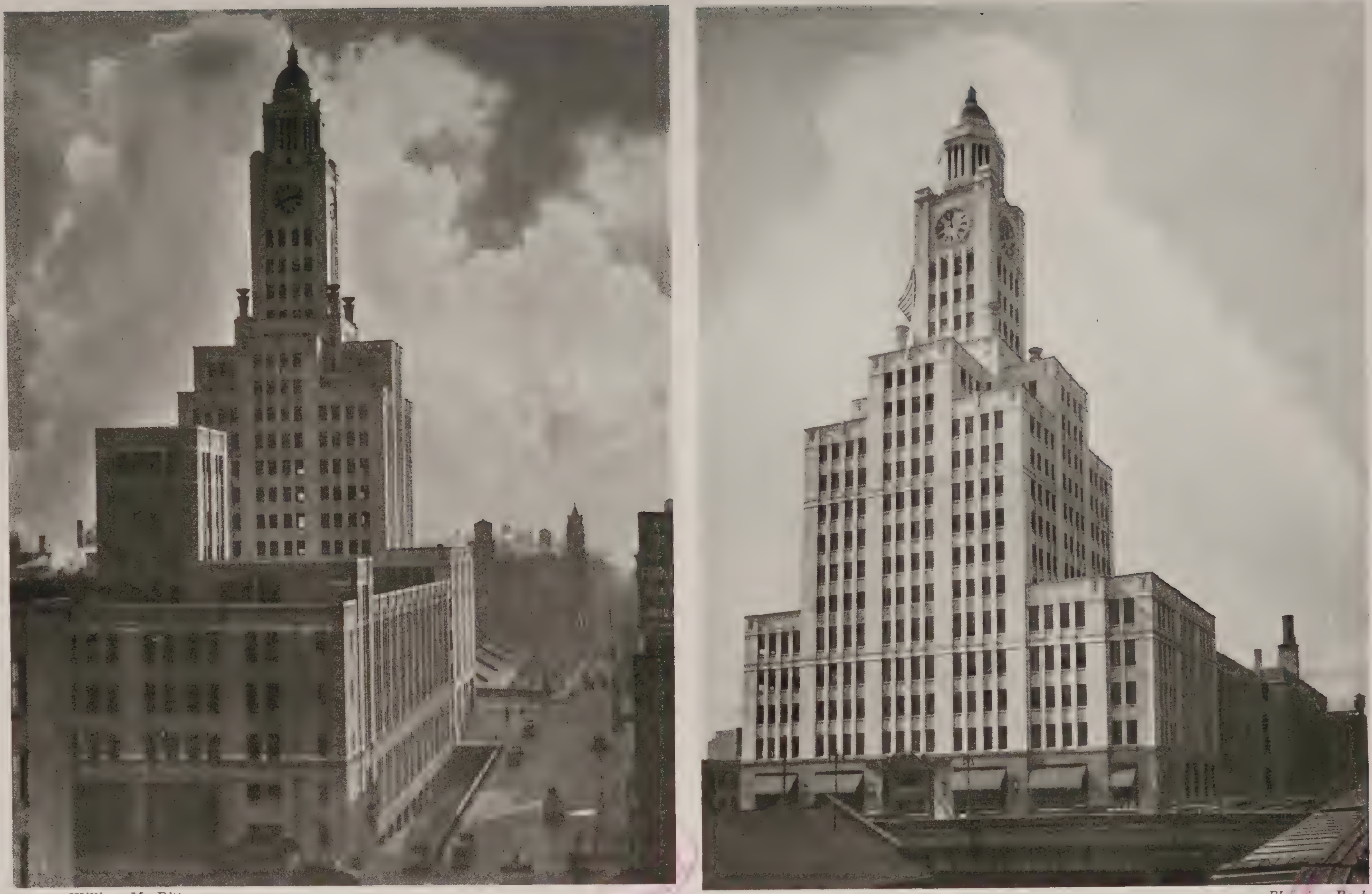


ENTRANCE LOBBY

BUILDING FOR PACIFIC GOODRICH RUBBER COMPANY, LOS ANGELES

CARL JUYLES WEYL, CONSULTING ARCHITECT

THE FOUNDATION COMPANY, ENGINEERS



Photos. William M. Rittase

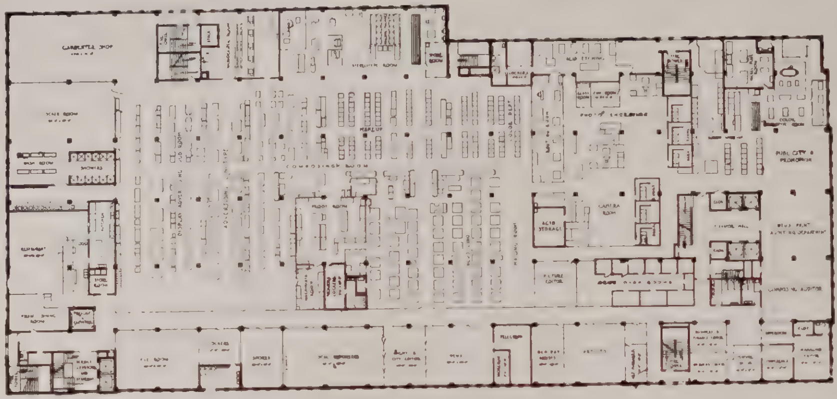
Plans on Back

TWO VIEWS, ELVERSON BUILDING, OCCUPIED BY THE PHILADELPHIA INQUIRER
RANKIN, KELLOGG & CRANE, ARCHITECTS

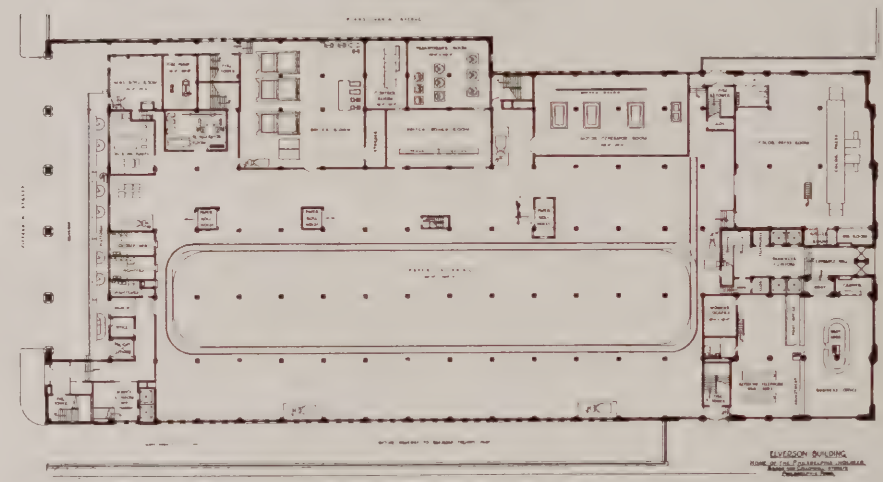
COST AND CONSTRUCTION DATA

Year of Completion: 1925.
Type of Construction: Steel frame.
Exterior Materials: Brick and terra cotta.
Floors: Concrete slabs.
Lighting: Electricity.

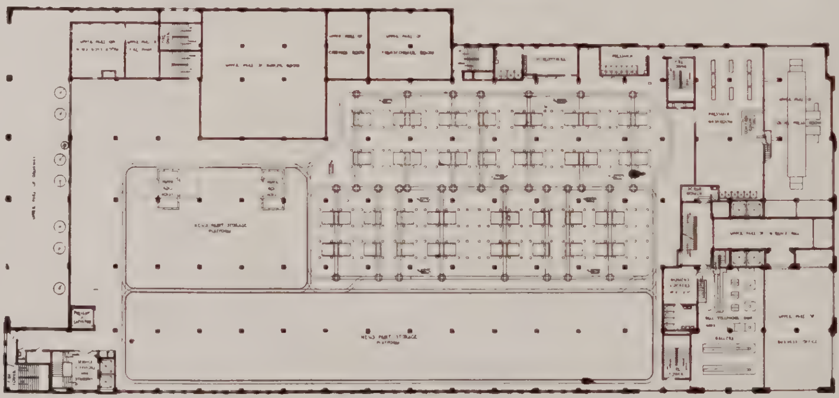
Heating: Steam; oil burners.
Ventilating: Forced for special areas.
Cubic Foot Cost: 46 cents.
Total Cost: $3,412,000.
Use of Building: Newspaper publishing plant.



FOURTH FLOOR



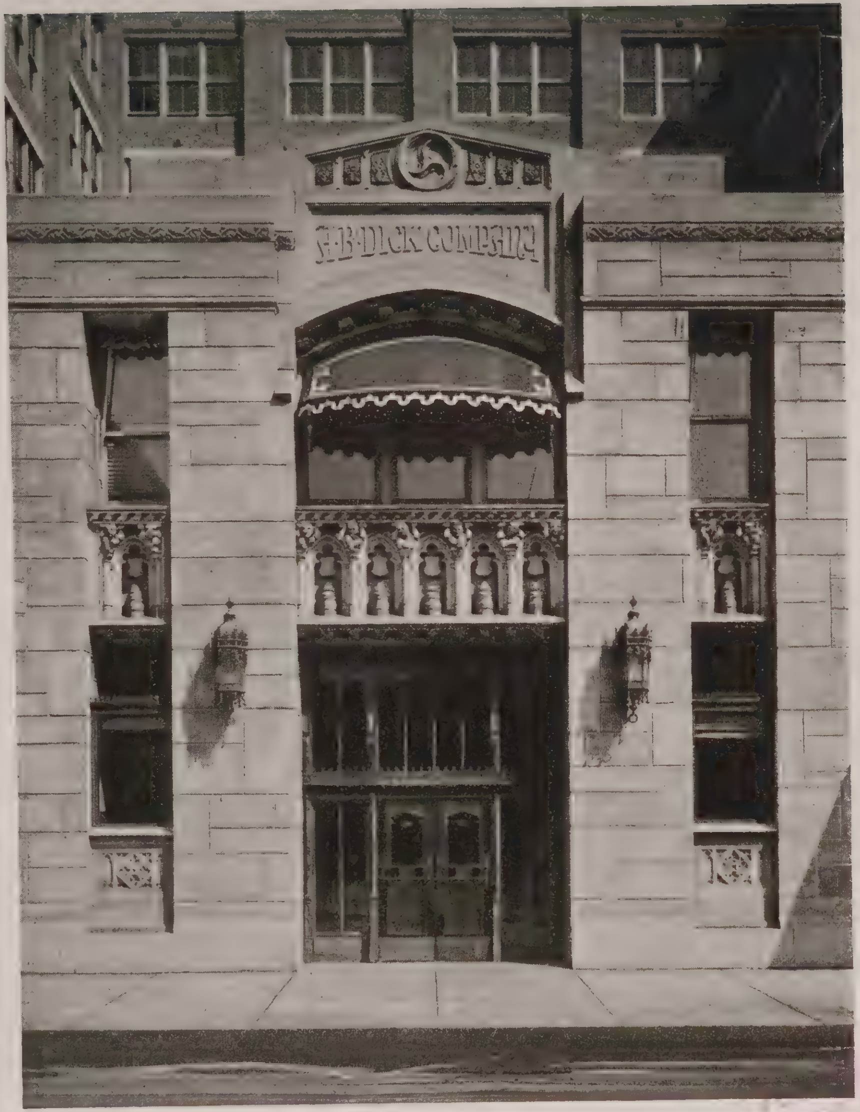
PAPER STORAGE FLOOR



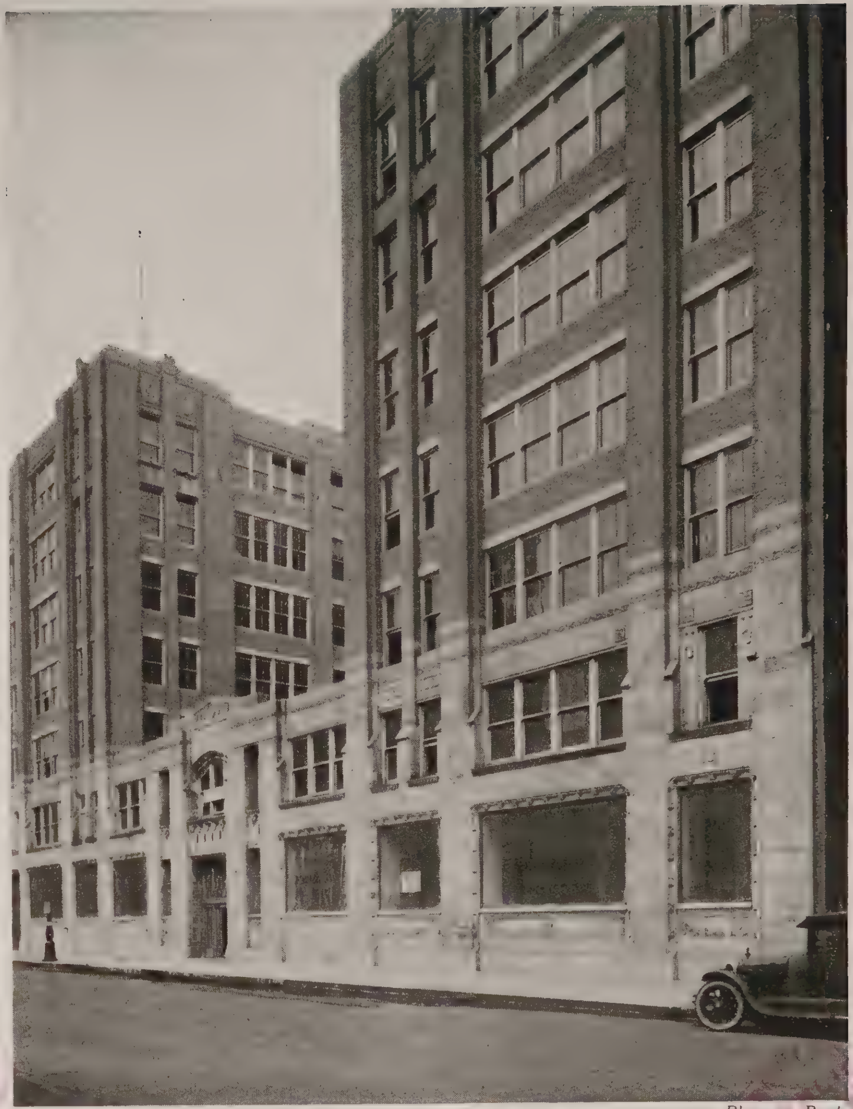
REEL ROOM FLOOR

PLANS. ELVERSON BUILDING, PHILADELPHIA, OCCUPIED BY THE PHILADELPHIA INQUIRER

RANKIN, KELLOGG & CRANE, ARCHITECTS



MAIN ENTRANCE



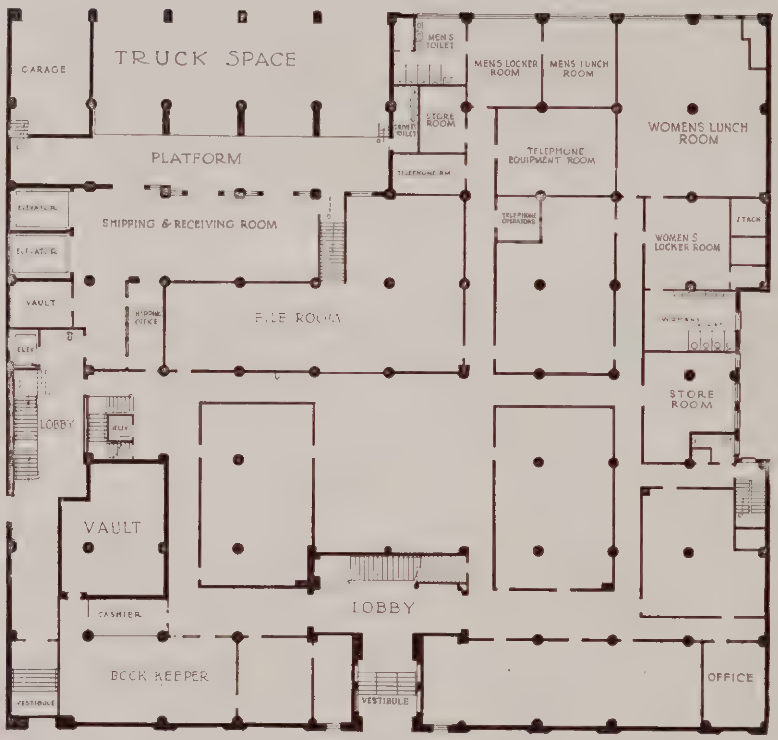
STREET FACADE

Plan on Back

BUILDING FOR A. B. DICK COMPANY, CHICAGO
ALFRED S. ALSCHULER, ARCHITECT

CONSTRUCTION DATA

Year of Completion: 1926.
Exterior Materials: Limestone and face brick.
Interior Materials: Walnut trim; marble in vestibule.
Floors: Maple, laid over a flat slab of reinforced concrete; offices, rubber tile; entrance lobby, marble.
Windows: Front elevation, wood sash; rear elevation, steel sash.
Lighting: Indirect in offices; typical factory units in work spaces.
Heating: Vacuum type with wall radiation.
Ventilating: Air conditioning apparatus and thermostatic control.
Use of Building: Assembling, storage and shipment of machines, and show rooms and general offices.



FIRST FLOOR

PLAN. BUILDING FOR A. B. DICK COMPANY, CHICAGO
ALFRED S. ALSCHULER, ARCHITECT

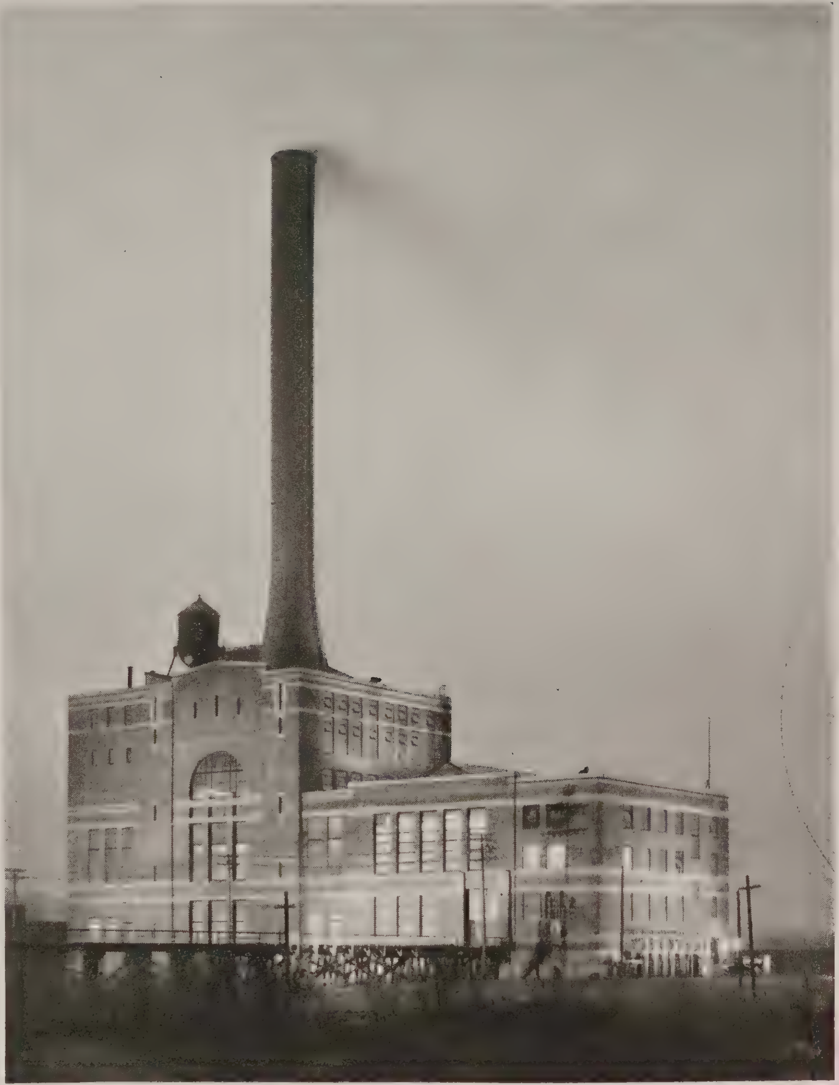
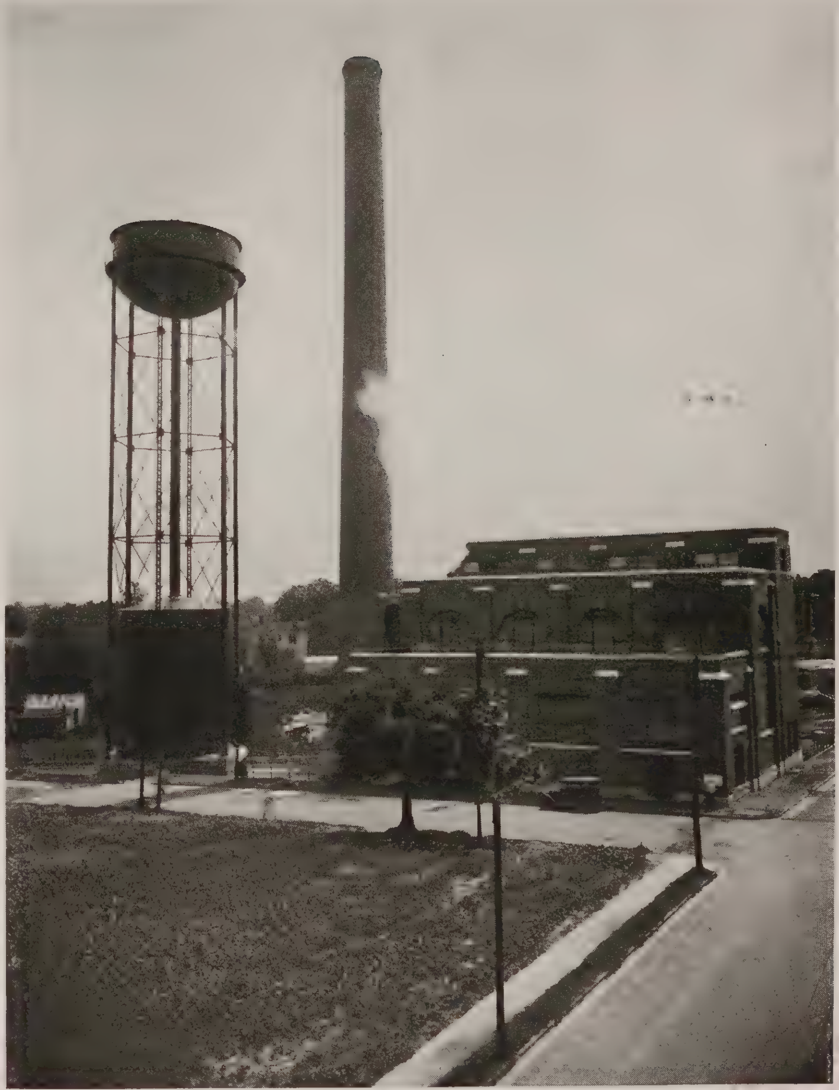


Photo. Northwestern Photographic Studios, Inc. Plan on Back

ISLAND STATION POWER PLANT, NORTHERN STATES POWER CO., ST. PAUL

TOLTZ, KING & DAY, ARCHITECTS



POWER PLANT, LIGGETT & MYERS TOBACCO CO., DURHAM, N. C.

DESIGNED BY LOCKWOOD GREENE ENGINEERS, INC.

CONSTRUCTION DATA

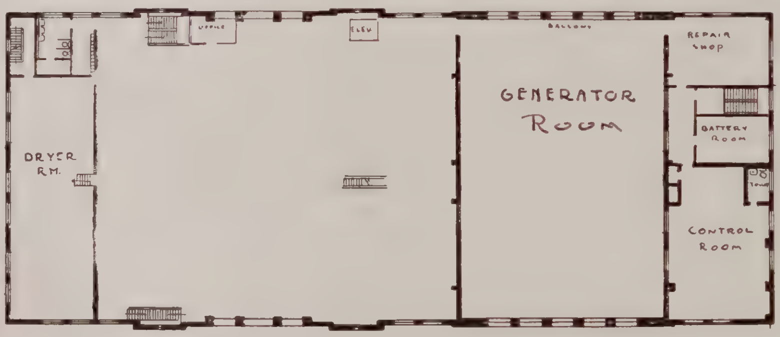
Type of Construction: Brick and steel.
Exterior Materials: Brick.
Interior Materials: Concrete floor and roof.
Floors: Concrete.
Windows: Steel.
Lighting: Electricity.
Heating: Boiler house.
Use of Building: Power plant.

(ABOVE) POWER PLANT, LIGGETT & MYERS TOBACCO CO., DURHAM, N. C.

DESIGNED BY LOCKWOOD GREENE, ENGINEERS, INC.

COST AND CONSTRUCTION DATA

Year of Completion: 1924.
Type of Construction: Reinforced concrete up to boiler room floor level; structural steel frame above.
Exterior Materials: Face brick trimmed with cast concrete.
Interior Materials: Walls enameled brick.
Floors: Quarry tile in turbine room; cement floors in boiler plant.
Windows: Steel sash.
Heating: Steam.
Cubic Foot Cost: Approximately 25 cents.
Total Cost: $600,000.



PLAN. ISLAND STATION POWER PLANT, NORTHERN STATES POWER CO., ST. PAUL

TOLTZ, KING & DAY, ARCHITECTS

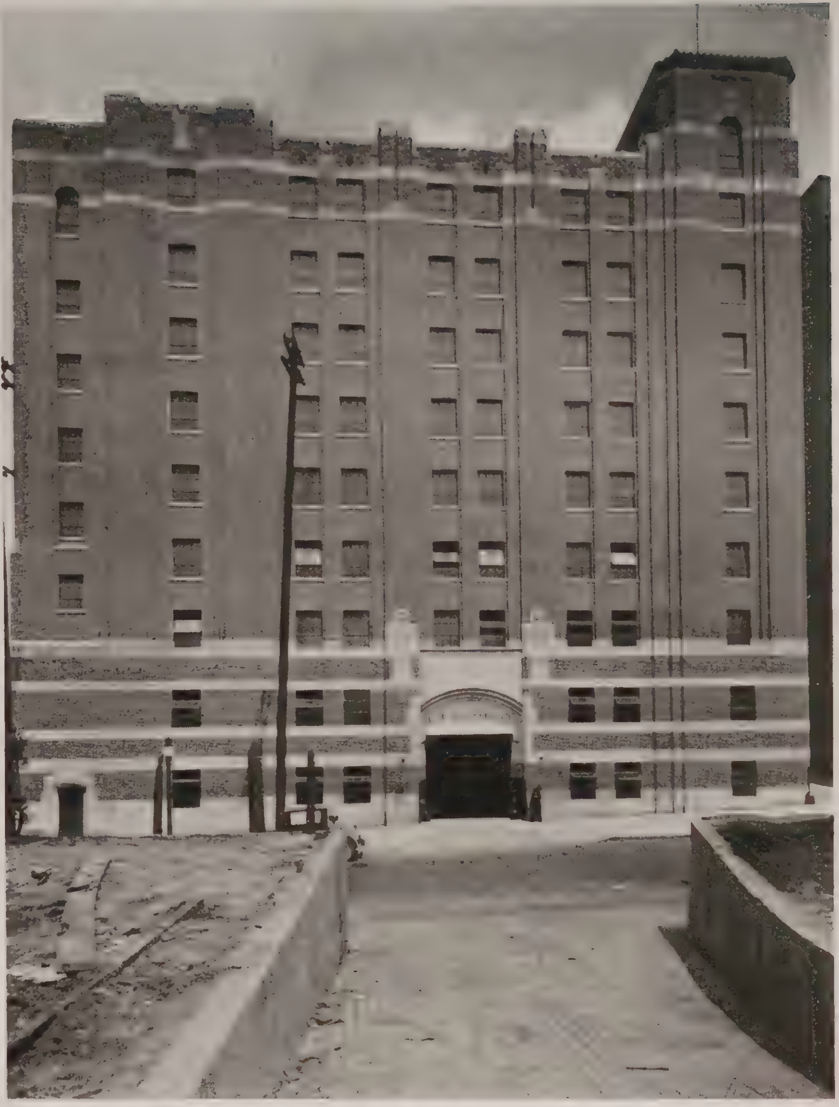
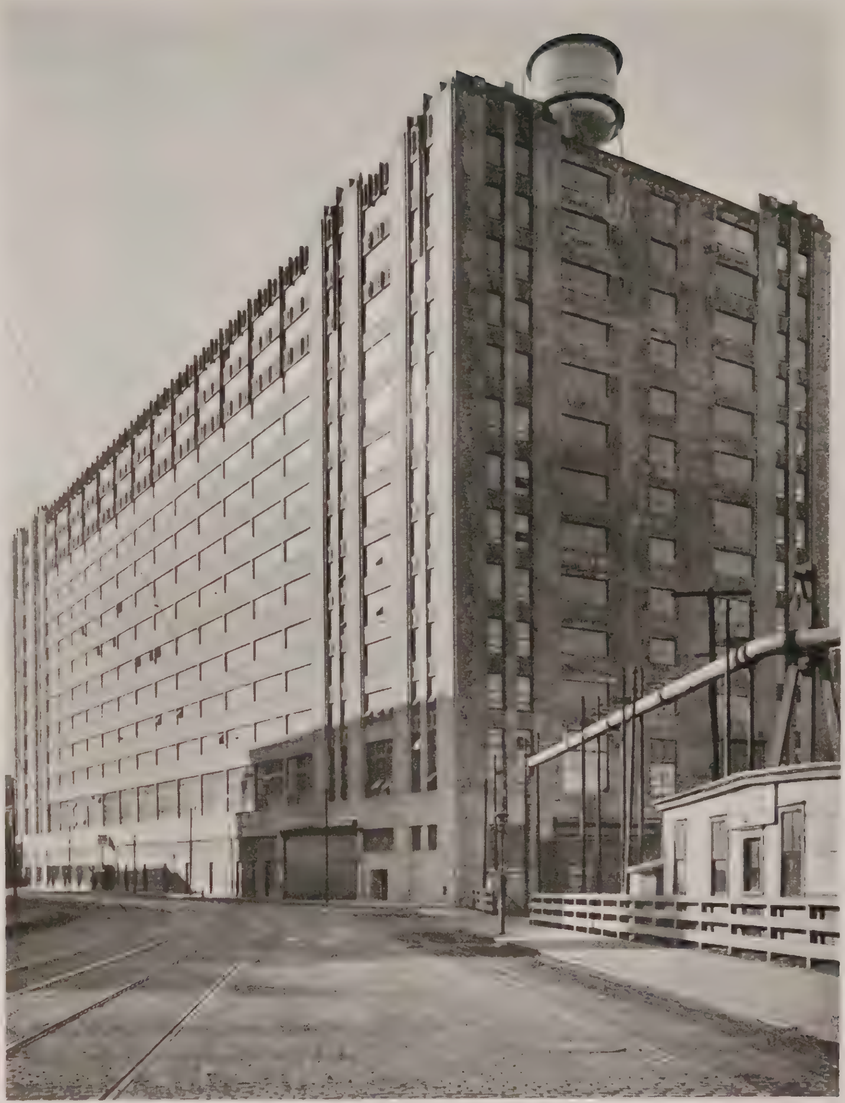


Photo. Thomas Ellison

Plan on Back

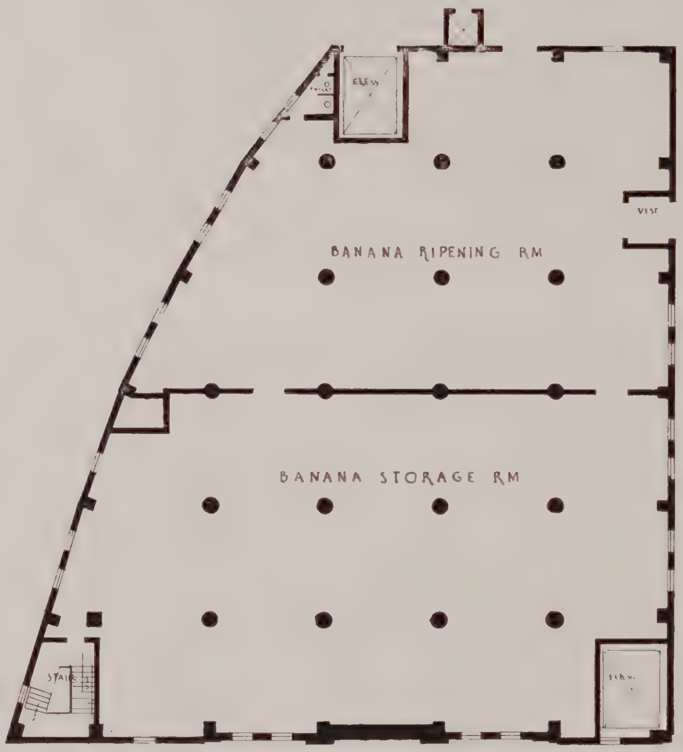
C. F. SMITH CO. WAREHOUSE, DETROIT
SMITH, HINCHMAN & GRYLLS, ARCHITECTS



NORTH STATION INDUSTRIAL BUILDING, BOSTON
S. SCOTT JOY, ARCHITECT

CONSTRUCTION DATA

Type of Construction: Reinforced concrete.
Exterior Materials: Brick with stone trim.
Interior Materials: Brick and concrete.
Floors: Cement.
Windows: Standard steel side wall sash, with reversible type sash on north wall.
Lighting: Direct.
Use of Building: Warehouse for grocery chain stores.



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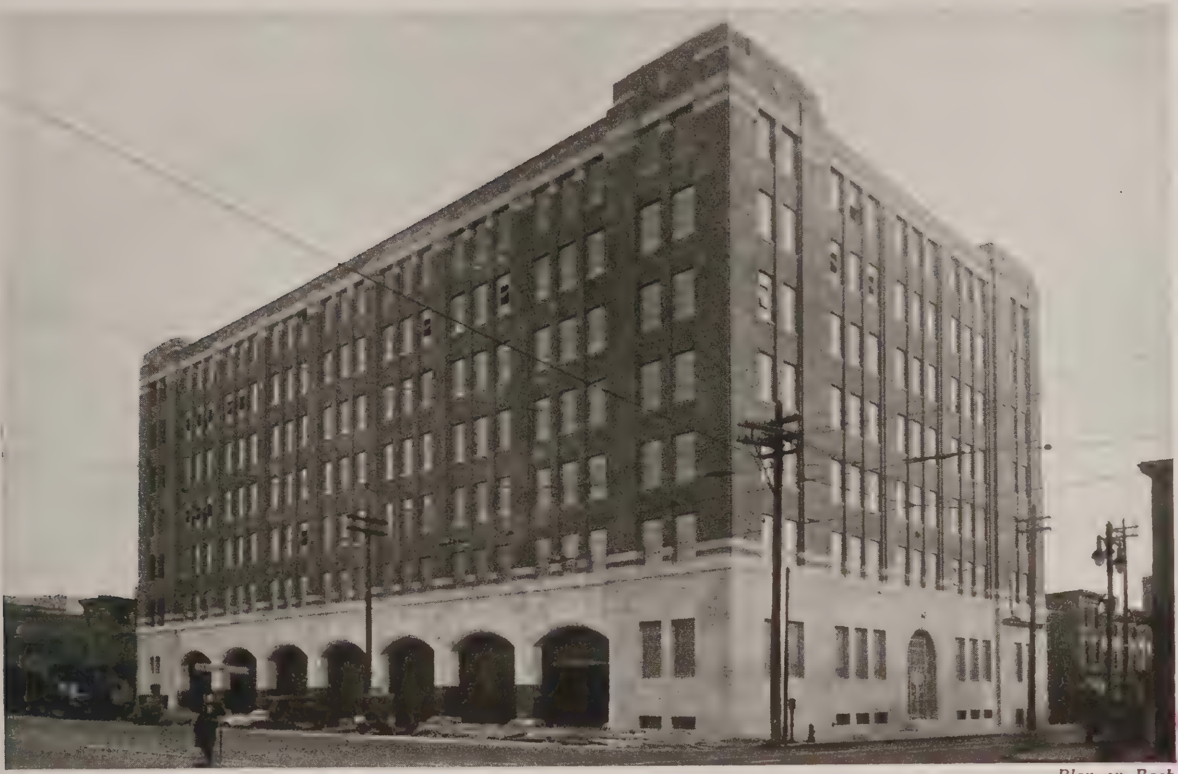
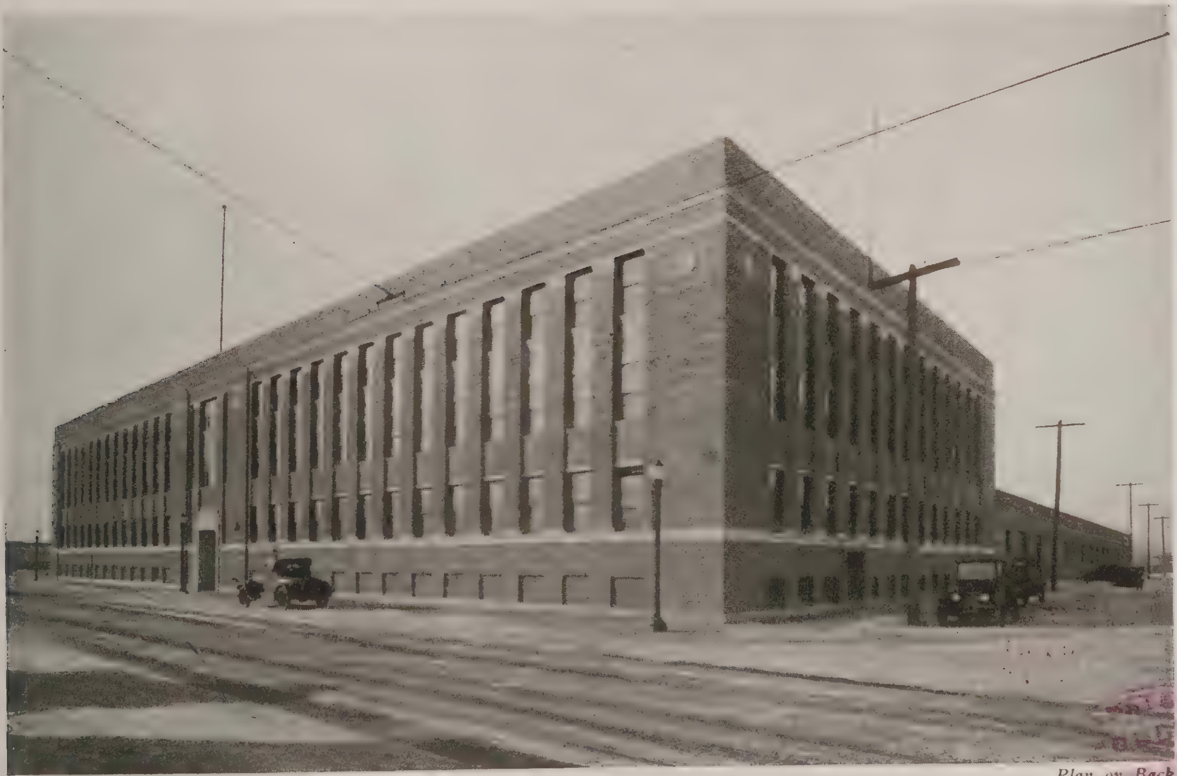
PLAN. C. F. SMITH COMPANY WAREHOUSE, DETROIT
SMITH, HINCHMAN & GRYLLS, ARCHITECTS

BOSTON PUBLIC LIBRARY



Plan on Back

BUILDING FOR PHILADELPHIA WHOLESALE DRUG CO.
RANKIN & KELLOGG, ARCHITECTS



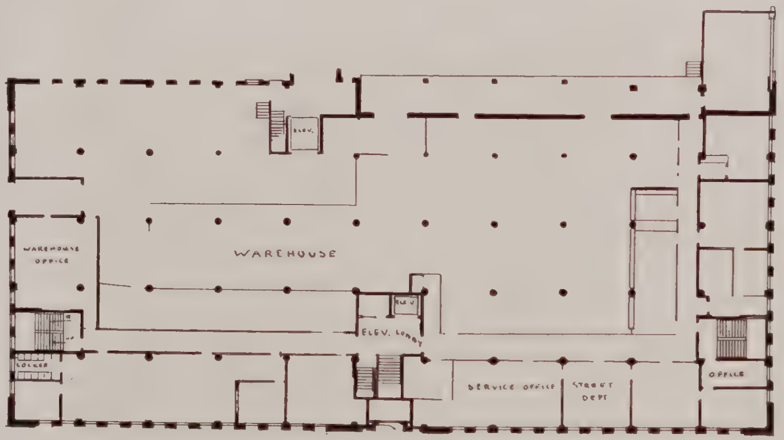
Plan on Back

Photo. Northwestern Photographic Studios, Inc.

SERVICE BUILDING, NORTHERN STATES POWER CO., ST. PAUL
TOLTZ, KING & DAY, ARCHITECTS

COST AND CONSTRUCTION DATA

Year of Completion: 1925.
Type of Construction: Reinforced concrete; frame building.
Exterior Materials: Brick and stone.
Floors: Cement.
Windows: Double-hung steel.
Lighting: Semi and direct throughout office areas; direct factory lighting throughout warehouse areas.
Heating: Steam, vacuum system, including boiler plant
Cubic Foot Cost: 28 cents.
Total Cost: Approximately $320,000.
Use of Building: Service and repair departments for power company and for warehouse for construction materials for city.



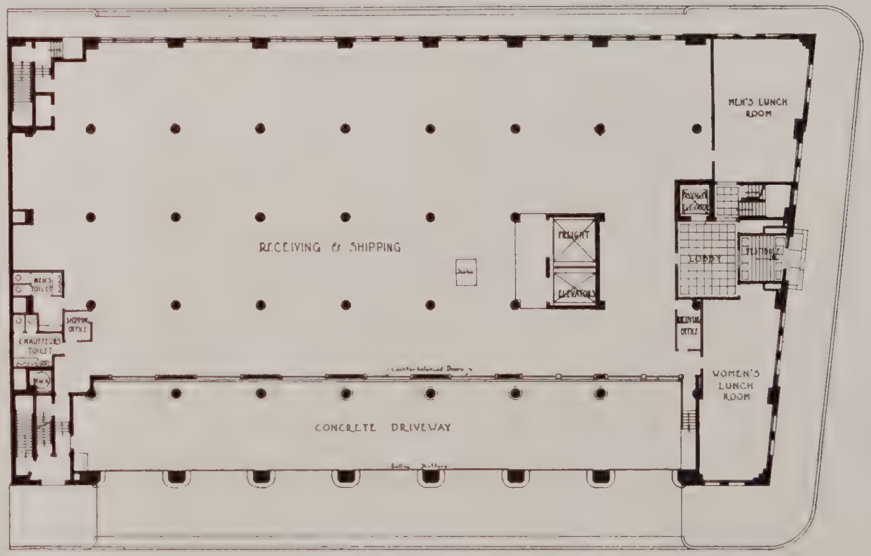
FIRST FLOOR

PLAN. SERVICE BUILDING, NORTHERN STATES POWER CO., ST. PAUL

TOLTZ, KING & DAY, ARCHITECTS

COST AND CONSTRUCTION DATA

Year of Completion: 1928.
Type of Construction: Reinforced concrete; mushroom columns.
Exterior Walls: Brick and stone.
Roof: Built-up.
Floors: Concrete.
Heating: Low-pressure steam.
Cubage of Buildings: 2,450,000.
Cubic Foot Costs: 24 cents.
Total Cost of Building: $588,000.



FIRST FLOOR

PLAN. BUILDING FOR PHILADELPHIA WHOLESALE DRUG COMPANY

RANKIN & KELLOGG, ARCHITECTS

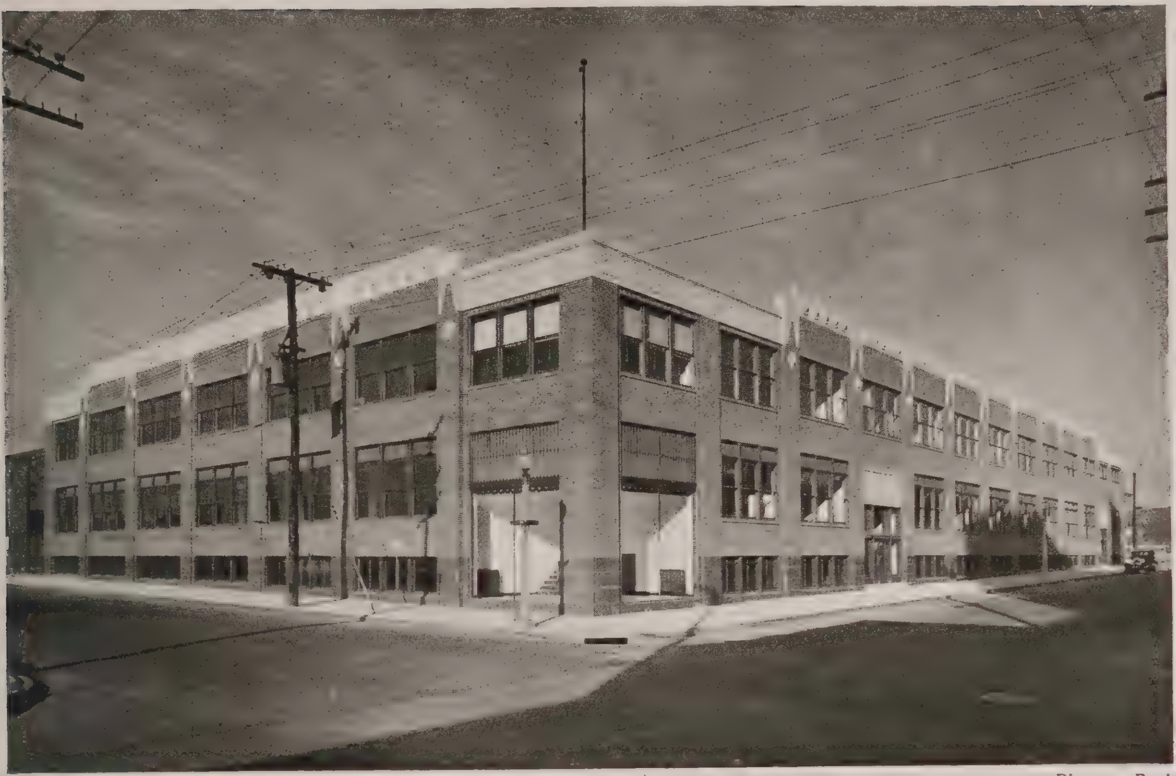


Photo. Alexander E. Piaget

Plan on Back

BUILDING FOR N. O. NELSON CO., ST. LOUIS
PRESTON J. BRADSHAW, ARCHITECT

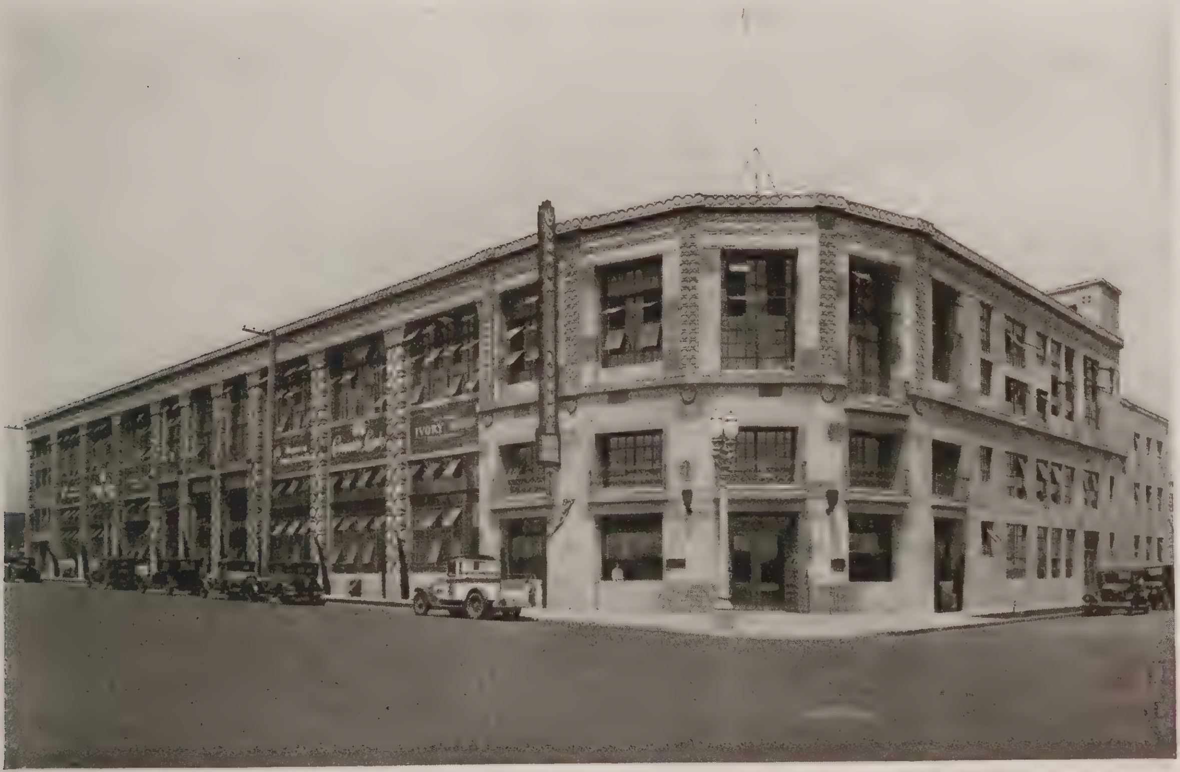


Photo. Graham Photo Co.

BUILDING FOR COMMUNITY LAUNDRY, LOS ANGELES
W. J. SAUNDERS, ARCHITECT

COST AND CONSTRUCTION DATA

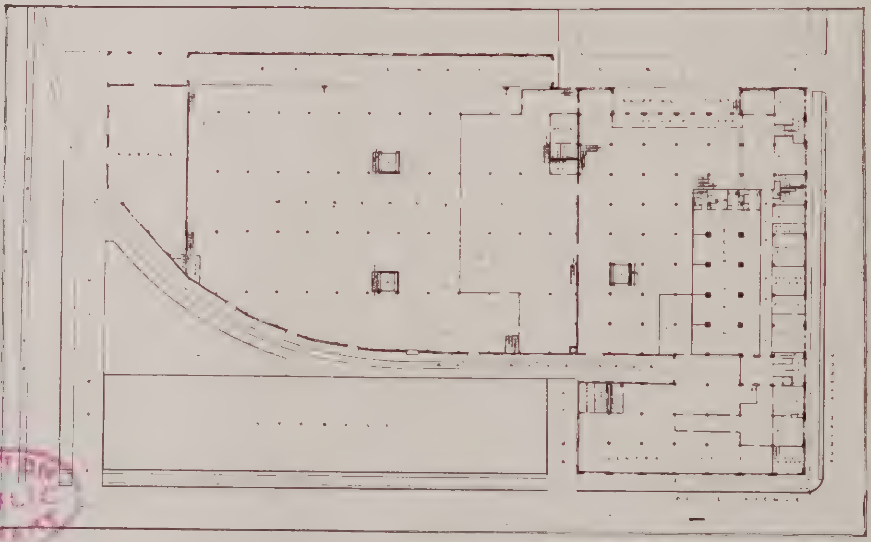
Year of Completion: 1929.
Type of Construction: Reinforced concrete.
Exterior Materials: Plaster.
Interior Materials: Plaster.
Floors: Concrete.
Windows: Steel sash.
Lighting: Electricity.
Heating: Steam.
Total Cost: $180,000.

BUILDING FOR COMMUNITY LAUNDRY, LOS ANGELES

W. J. SAUNDERS, ARCHITECT

COST AND CONSTRUCTION DATA

Year of Completion: 1929.
Type of Construction: Fireproof.
Exterior Materials: Brick and terra cotta.
Interior Materials: Plaster, marble and zenitherm.
Floors: Cement and hardwood.
Windows: Wood and steel.
Lighting: Regular and ornamental.
Heating: Steam.
Ventilating: Mechanical.
Cubic Foot Cost: Approximately 21 cents.
Total Cost: Approximately $299,000.
Use of Building: Plumbing supply display, warehouse and general offices.



FIRST FLOOR

PLAN. BUILDING FOR N. O. NELSON CO., ST. LOUIS
PRESTON J. BRADSHAW, ARCHITECT

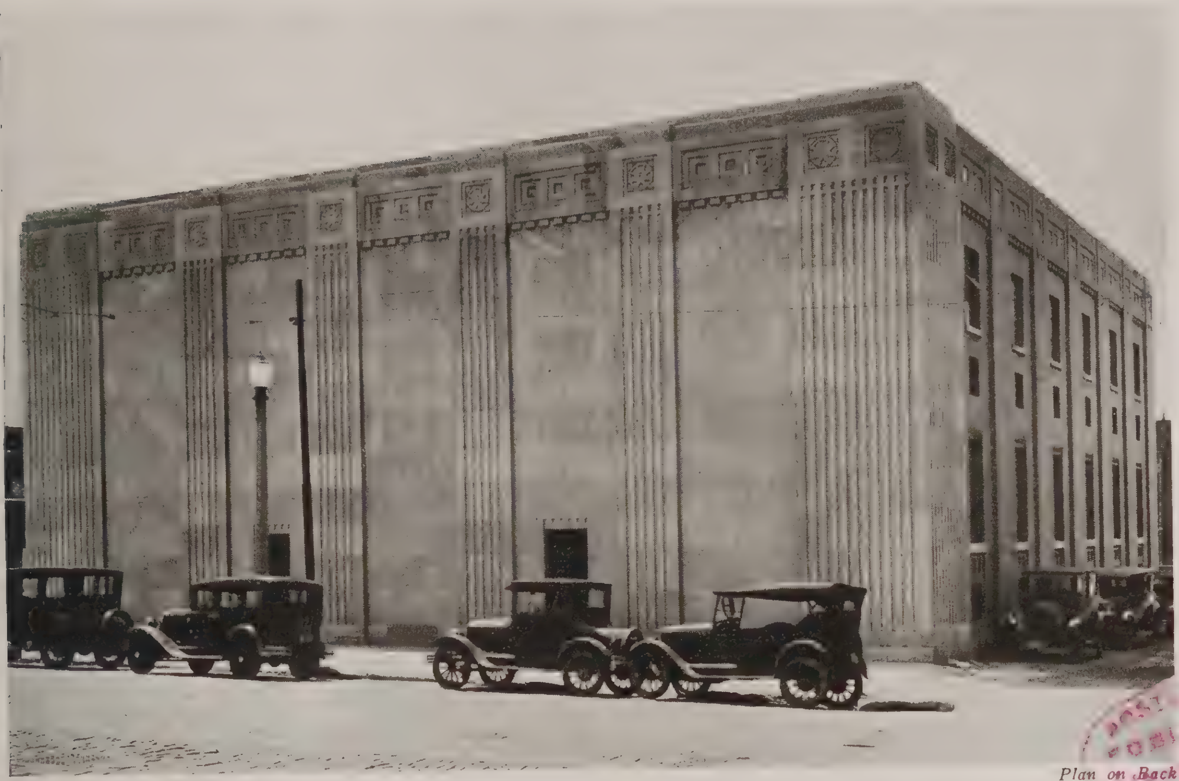


Photo. Alexander E. Piaget *Plan on Back*

PLAZA SUB-STATION, UNION ELECTRIC LIGHT & POWER CO., ST. LOUIS

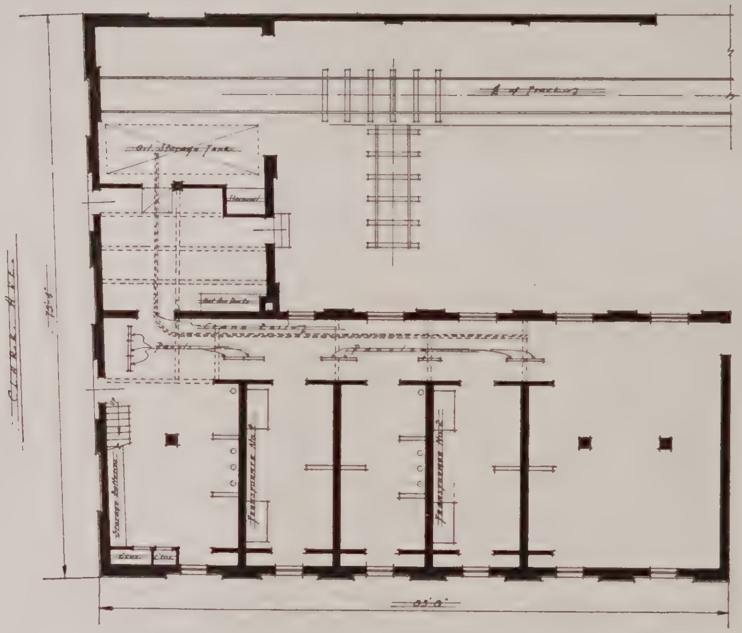
LA BEAUME & KLEIN, ARCHITECTS

BUILDING FOR EDISON COMPANY, CHICAGO

HOLABIRD & ROOT, ARCHITECTS

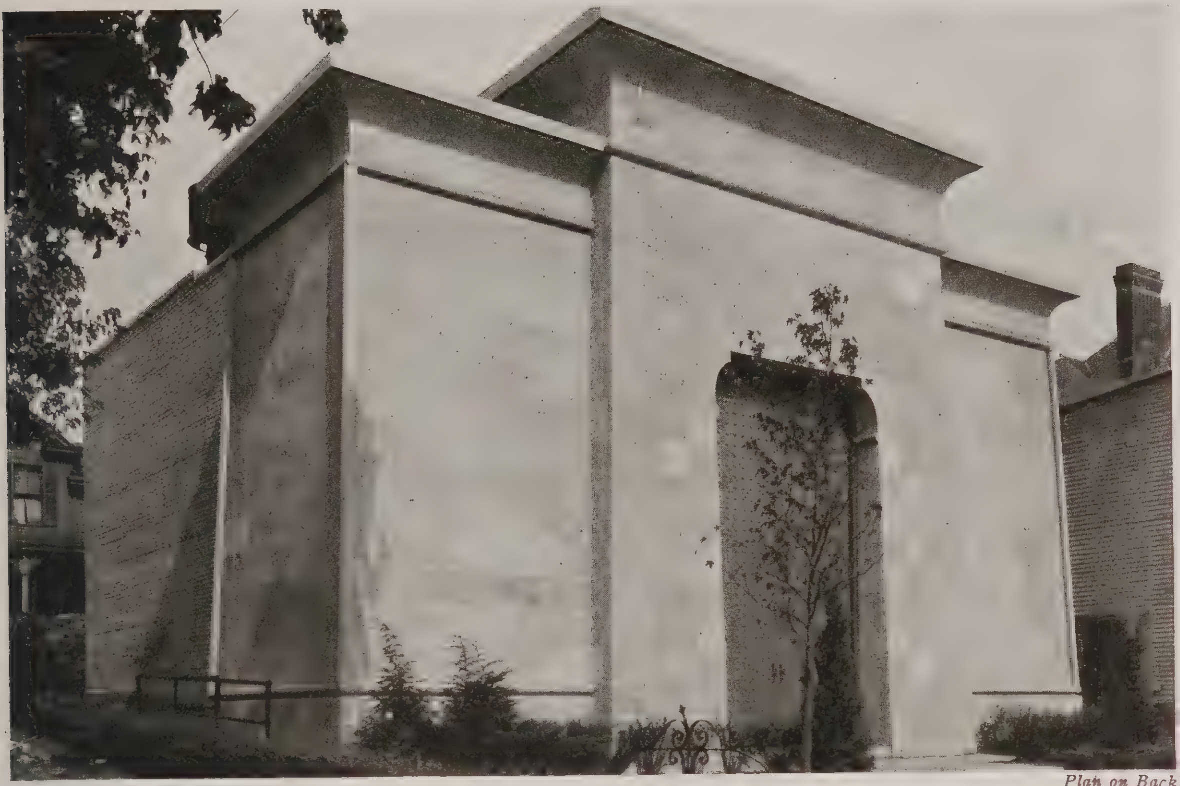
COST AND CONSTRUCTION DATA

Year of Completion: 1928.
Type of Construction: Fireproof brick; reinforced concrete.
Exterior Materials: Stone.
Interior Materials: Brick.
Floors: Concrete.
Windows: Steel.
Ventilating: Louvers.
Cubic Foot Cost: 52 cents.
Total Cost: $75,000, exclusive of equipment.
Use of Building: Transformer sub-station.



FIRST FLOOR

PLAN. PLAZA SUB-STATION, UNION ELECTRIC LIGHT & POWER CO., ST. LOUIS
LA BEAUME & KLEIN, ARCHITECTS



Plan on Back

DELTA AVENUE STATION, CINCINNATI STREET RAILWAY, CINCINNATI
HAKE & KUCK, ARCHITECTS

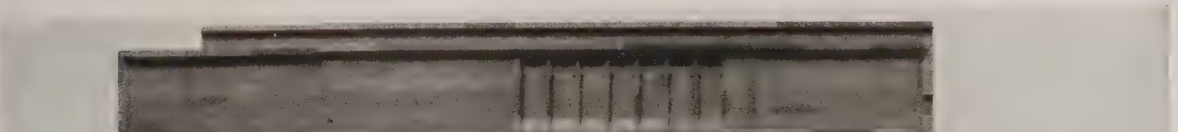


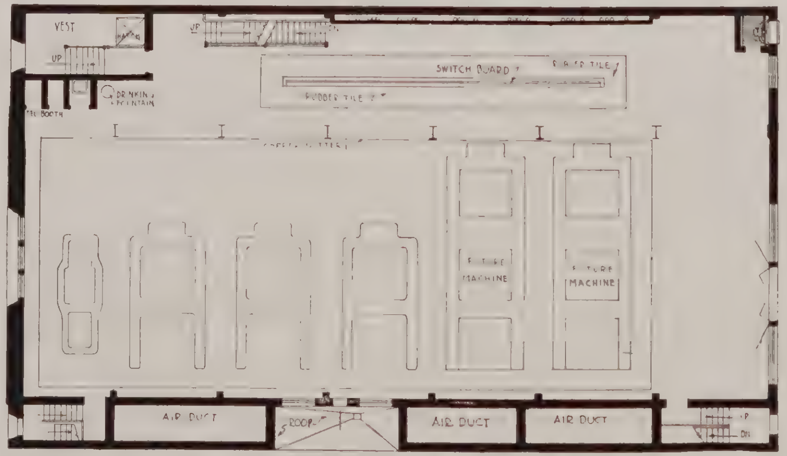
Photo. Manning Bros.

Plan on Back

CHARLOTTE AVENUE SUB-STATION, DETROIT EDISON COMPANY
DESIGNED BY DRAFTING & SURVEYING BUREAU, DETROIT EDISON COMPANY

COST AND CONSTRUCTION DATA

Year of Completion: 1926.
Type of Construction: Fireproof.
Exterior Materials: Face brick and limestone front.
Interior Materials: Pressed brick.
Floors: Main floors, quarry tile on reinforced concrete.
Windows: Steel sash.
Lighting: Direct.
Heating: Steam.
Ventilating: Mechanical.
Cubic Foot Cost: Approximately 50 cents for superstructure.
Total Cost: Approximately $280,000.
Use of Building: Electric sub-station.



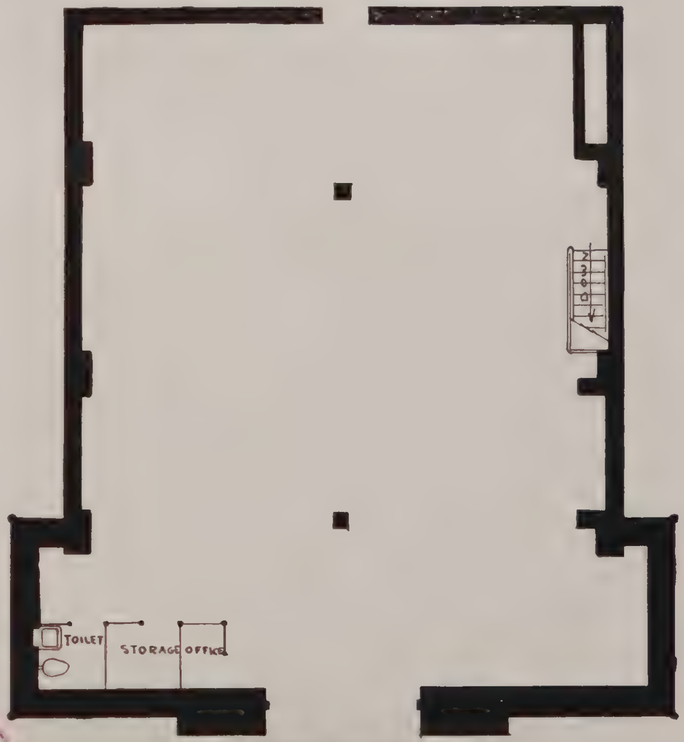
MACHINE ROOM PLAN

PLAN. CHARLOTTE AVENUE SUB-STATION, DETROIT EDISON COMPANY

DESIGNED BY DRAFTING & SURVEYING BUREAU, DETROIT EDISON CO.

COST AND CONSTRUCTION DATA

Year of Completion: 1928.
Type of Construction: Reinforced concrete and structural steel.
Exterior Materials: Limestone.
Interior Materials: Face brick wall; exposed concrete ceilings.
Floors: Cement.
Lighting: Electric.
Ventilating: Gravity ventilators.
Cubic Foot Cost: 61 cents.
Total Cost: $35,266.
Use of Building: Transformer sub-station.

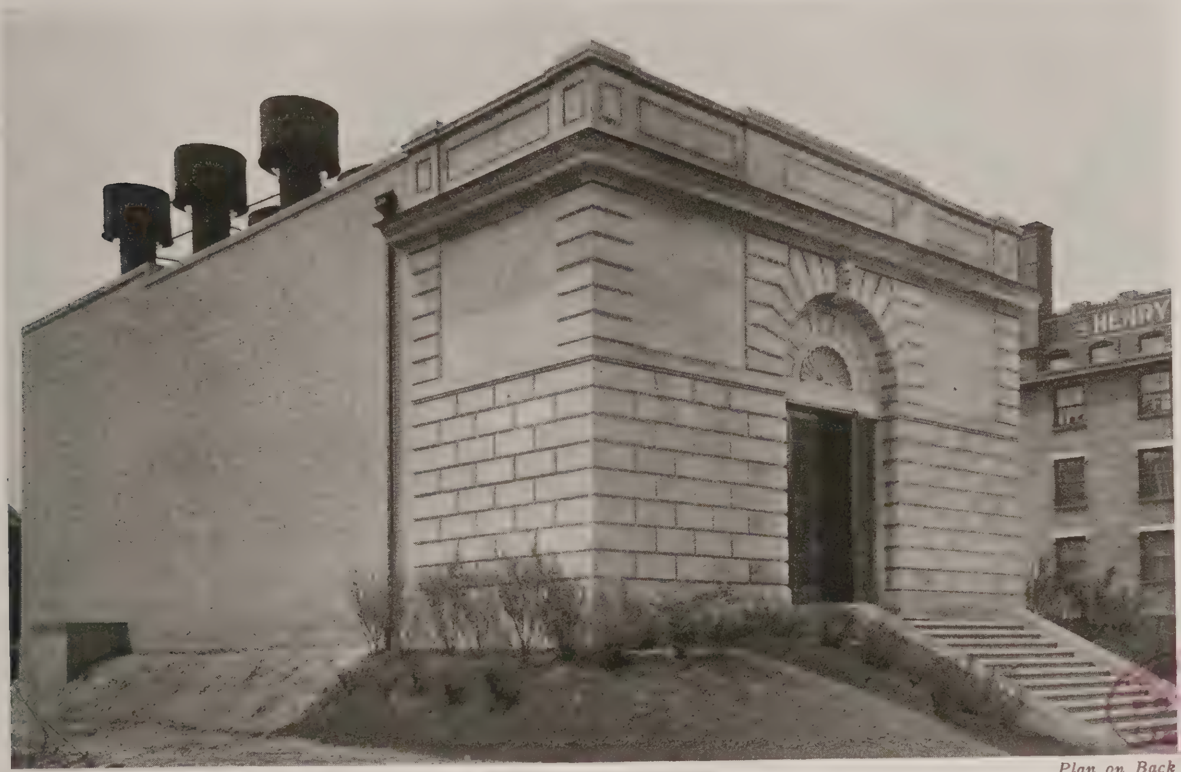


FIRST FLOOR

PLAN. DELTA AVENUE STATION, CINCINNATI STREET RAILWAY, CINCINNATI

HAKE & KUCK, ARCHITECTS

BOSTON PUBLIC LIBRARY



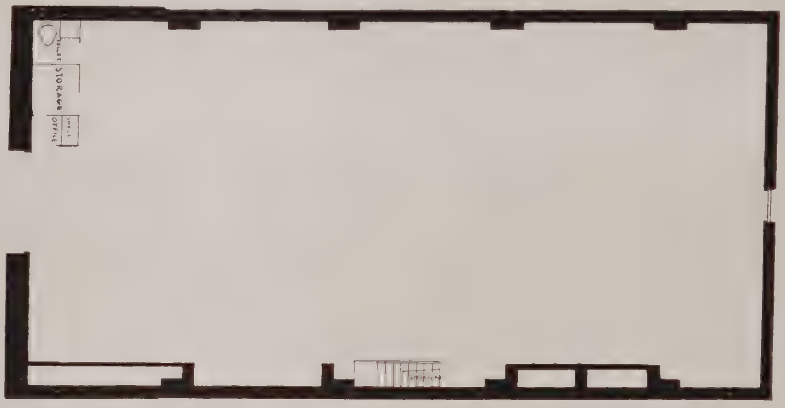
Plan on Back

LINCOLN STATION, CINCINNATI STREET RAILWAY
HAKE & KUCK, ARCHITECTS

O'BRIEN STREET STATION, CINCINNATI STREET RAILWAY
HAKE & KUCK, ARCHITECTS

COST AND CONSTRUCTION DATA

Year of Completion: 1928.
Type of Construction: Reinforced concrete and structural steel.
Exterior Materials: Limestone.
Interior Materials: Face brick wall; exposed concrete ceilings.
Floors: Cement.
Lighting: Electricity.
Ventilating: Gravity ventilators.
Cubic Foot Cost: 53 cents.
Total Cost: $48,000.
Use of Building: Transformer sub-station.



FIRST FLOOR

PLAN, LINCOLN STATION, CINCINNATI STREET RAILWAY CO.
HAKE & KUCK, ARCHITECTS

BOSTON PUBLIC LIBRARY

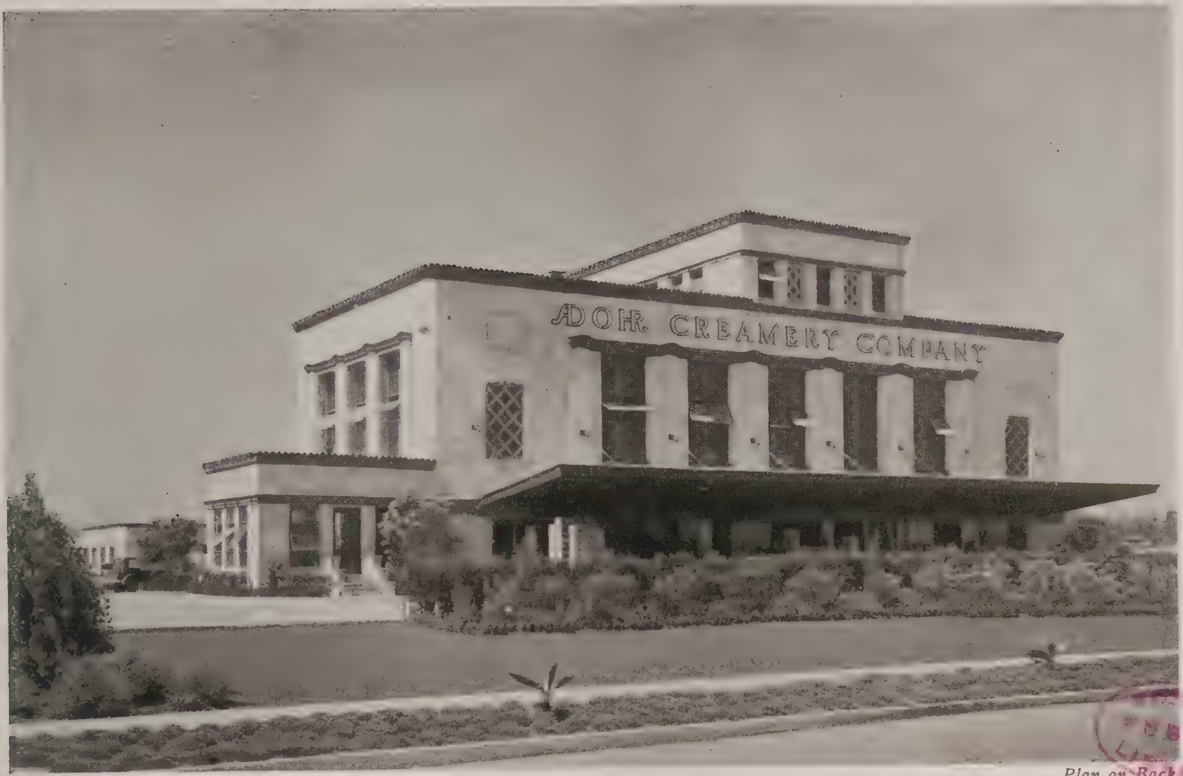


Photo. Mott Studios

Plan on Back

BUILDING FOR ADOHR CREAMERY CO., LOS ANGELES
MORGAN, WALLS & CLEMENTS, ARCHITECTS

PUBLIC LIBRARY

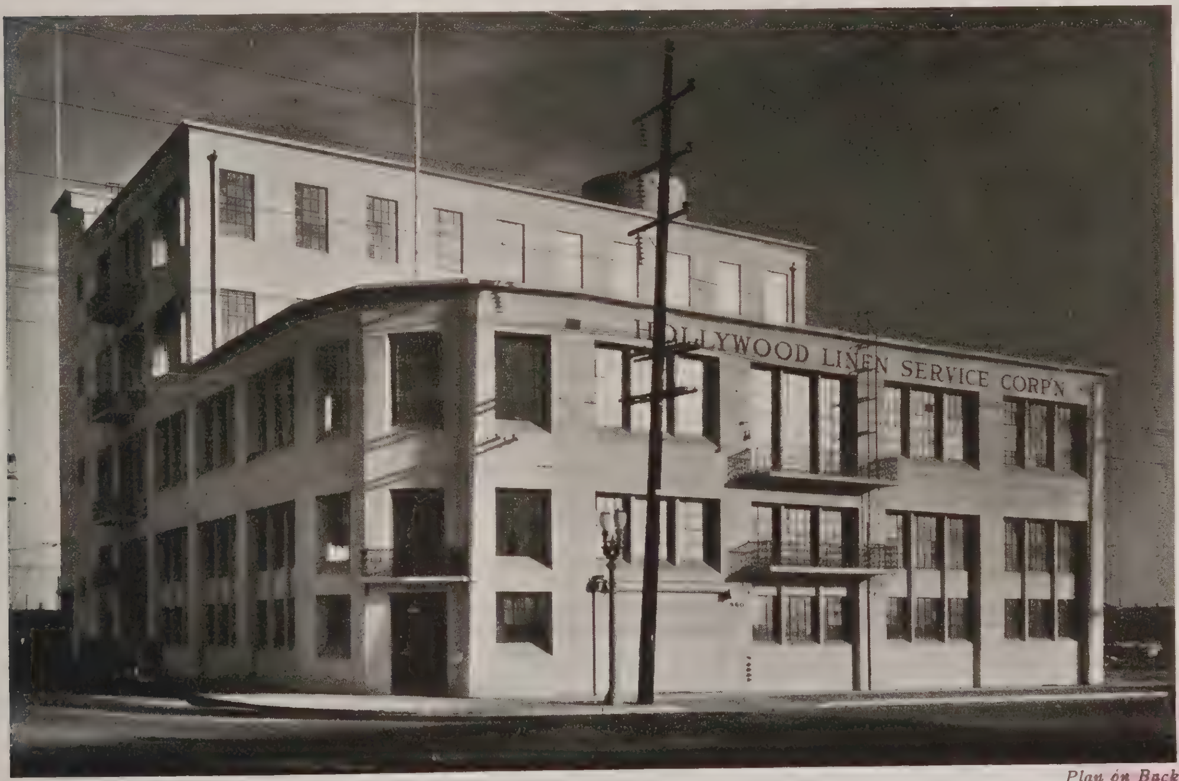


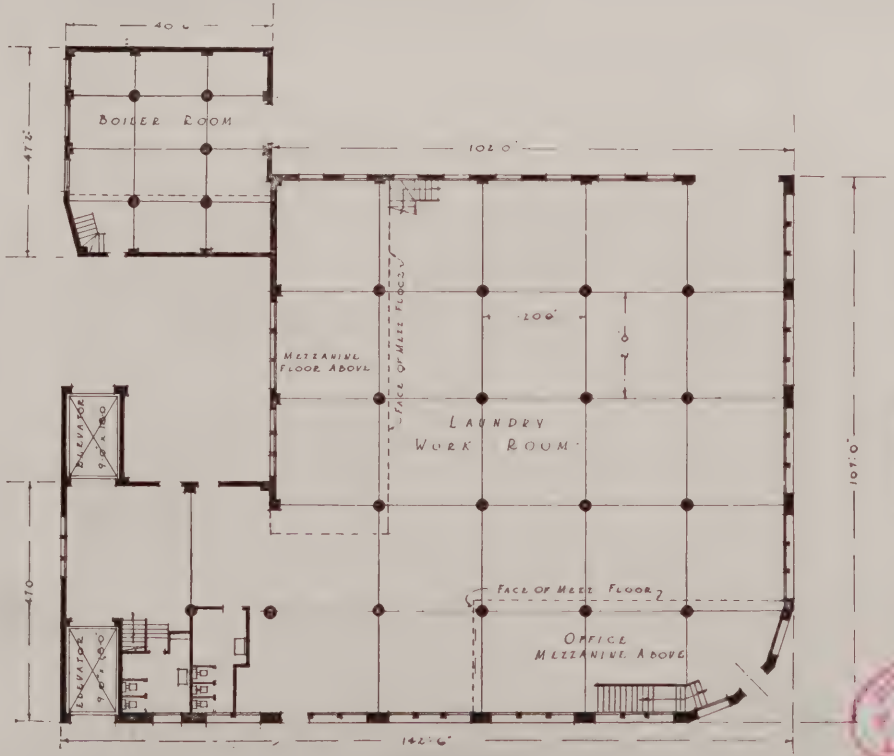
Photo. Graham Photo Co.

Plan on Back

BUILDING FOR HOLLYWOOD LINEN SERVICE CORP., LOS ANGELES
W. J. SAUNDERS, ARCHITECT

COST AND CONSTRUCTION DATA

Year of Completion: 1929.
Type of Construction: Reinforced concrete.
Exterior Materials: Cement.
Interior Materials: Cement and plaster.
Floors: Flat slab.
Windows: Steel sash.
Lighting: Electric.
Heating: Gas radiators for office spaces.
Total Cost: $100,000.



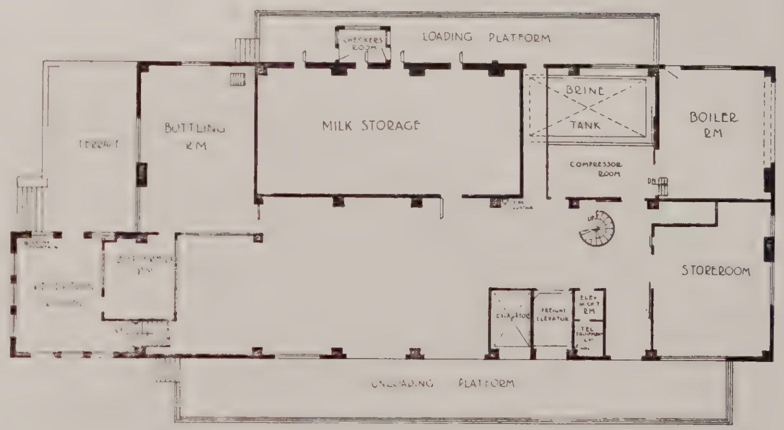
FIRST FLOOR

PLAN. BUILDING FOR HOLLYWOOD LINEN SERVICE CORP., LOS ANGELES

W. J. SAUNDERS, ARCHITECT

COST AND CONSTRUCTION DATA

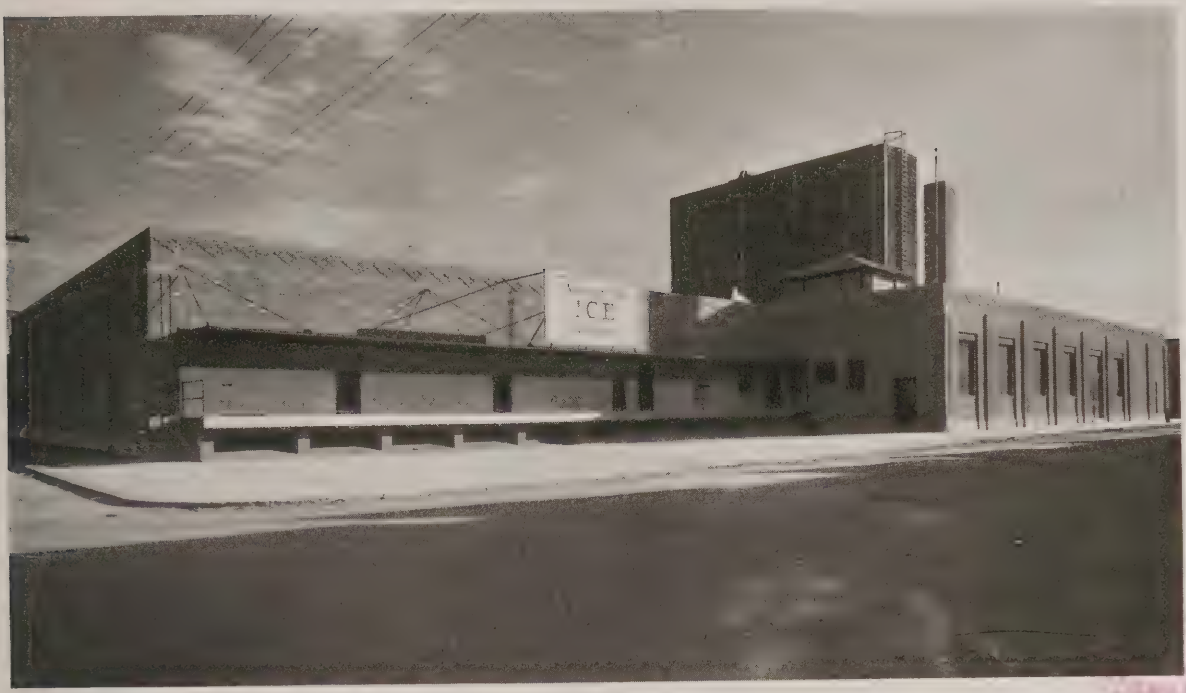
Year of Completion: 1926.
Type of Construction: Reinforced concrete.
Exterior Materials: Plaster, cast stone trim.
Interior Materials: Plaster.
Floors: Cement.
Windows: Steel sash.
Lighting: General illumination.
Heating: Steam.
Total Cost: $115,000.
Use of Building: Milk plant.



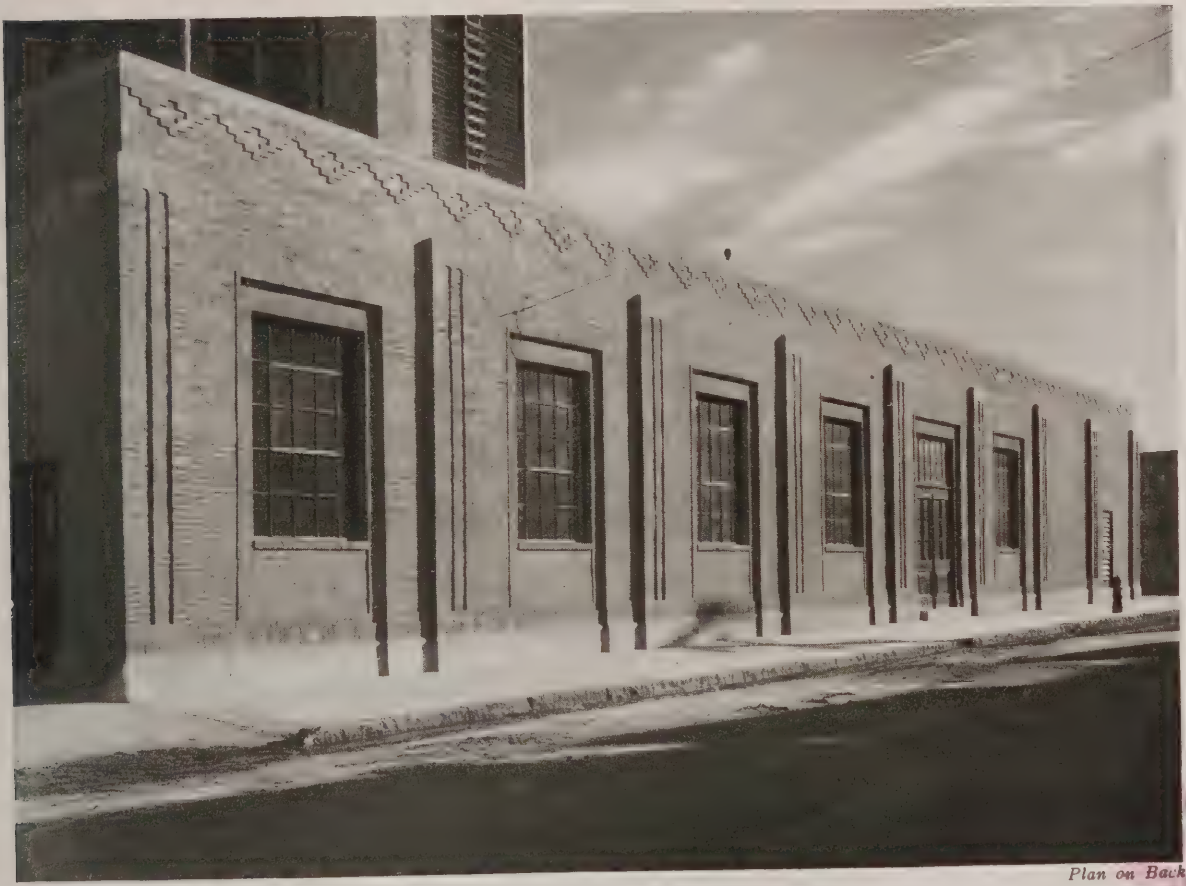
FIRST FLOOR

PLAN. BUILDING FOR ADOHR CREAMERY CO., LOS ANGELES

MORGAN, WALLS & CLEMENTS, ARCHITECTS



GENERAL VIEW



Photos. Paul J. Weber

Plan on Back

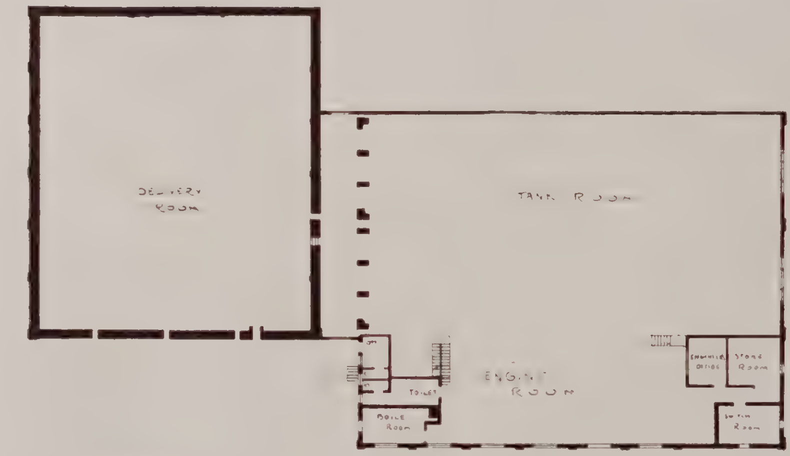
FRONT ELEVATION

BUILDING FOR BOSTON ICE CO., CAMBRIDGE, MASS.

C. LESLIE WEIR, ARCHITECT

COST AND CONSTRUCTION DATA

Year of Completion: 1928.
Type of Construction: Brick; steel frame; wood roof.
Exterior Materials: Brick.
Interior Materials: Face brick.
Floors: Tile.
Windows: Galvanized iron sash.
Lighting: Electricity.
Heating: Steam.
Cubic Foot Cost: 21 cents.
Total Cost: $70,000.
Use of Building: Ice manufacturing plant.



FIRST FLOOR

PLAN. BUILDING FOR BOSTON ICE CO., CAMBRIDGE, MASS.

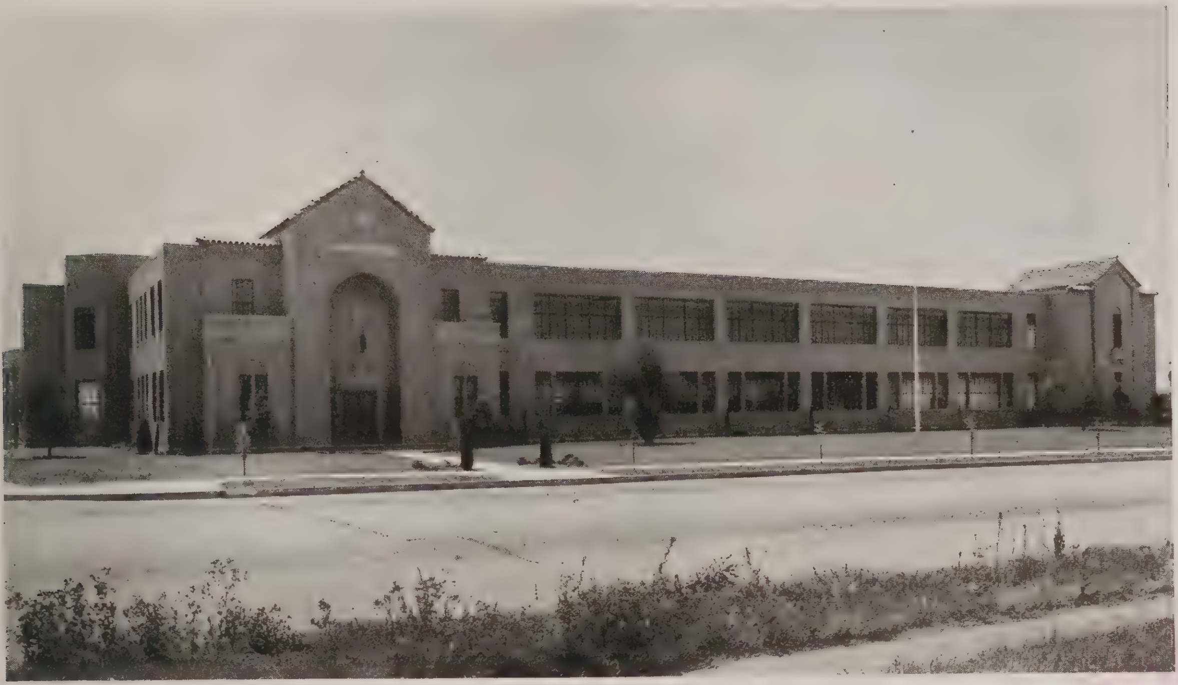
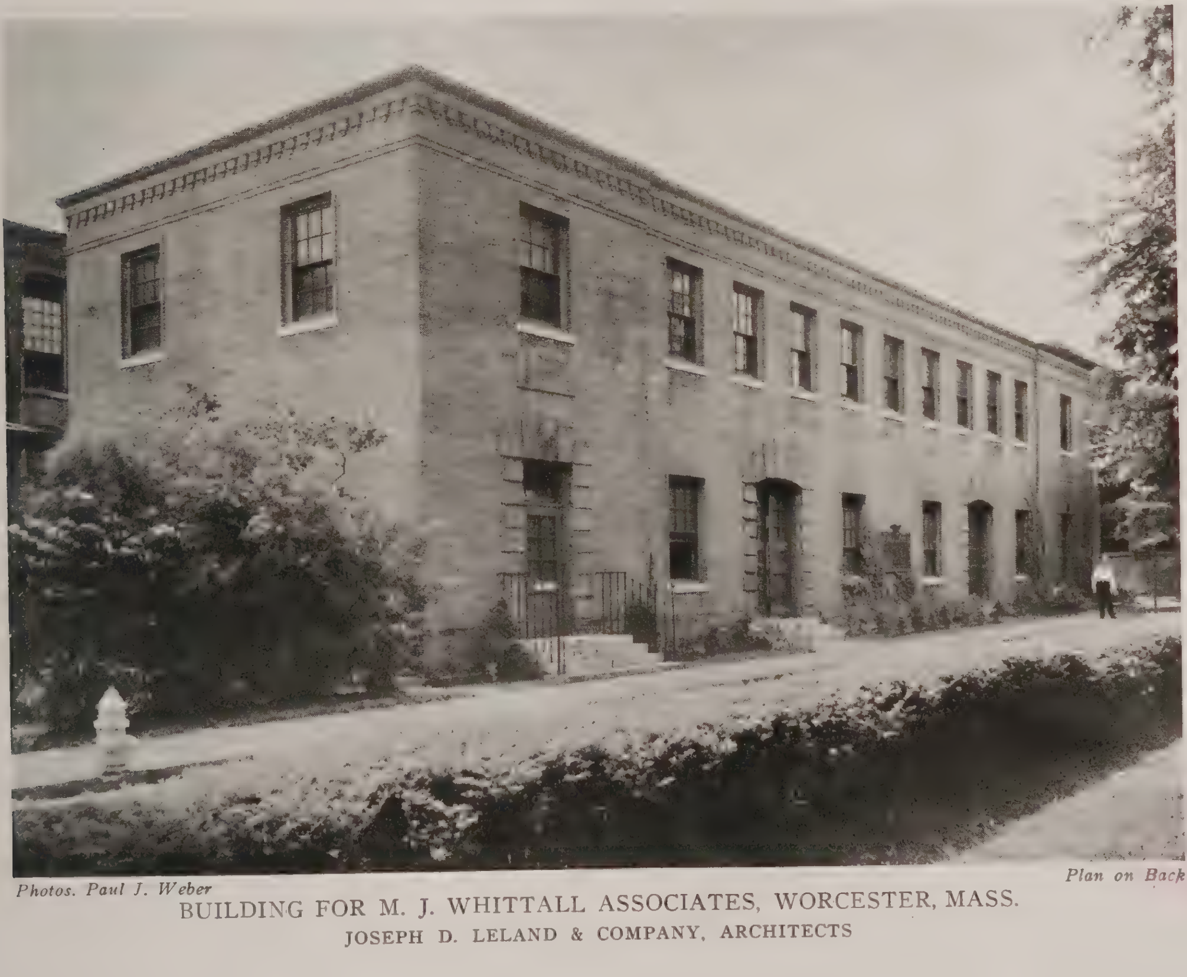


Photo. Keystone Photo Service

BUILDING FOR THE KITTINGER COMPANY, LOS ANGELES

DESIGNED BY THE KITTINGER COMPANY



Photos. Paul J. Weber

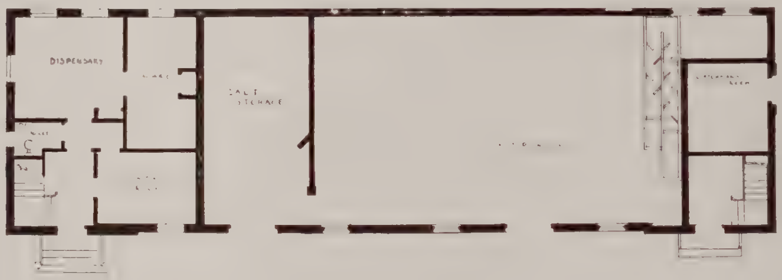
Plan on Back

BUILDING FOR M. J. WHITTALL ASSOCIATES, WORCESTER, MASS.

JOSEPH D. LELAND & COMPANY, ARCHITECTS

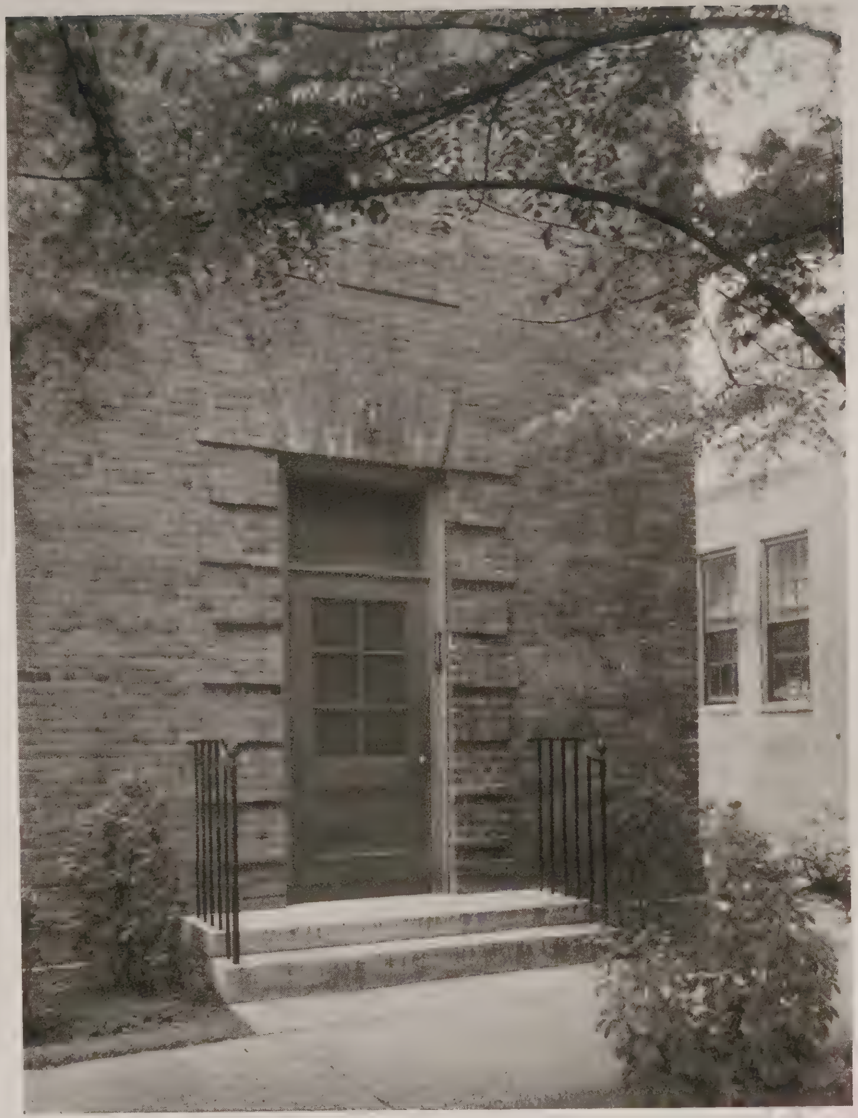
COST AND CONSTRUCTION DATA

Year of Completion: 1927.
Type of Construction: First class, with wood roof.
Exterior Materials: Brick and artificial stone.
Interior Materials: Walls and ceilings of plaster except in water softening room which is unfinished.
Floors: First floor, concrete; second floor, maple; magnesite in dispensary.
Windows: Copper covered.
Lighting: Electricity.
Heating: Steam.
Cubic Foot Cost: 49 cents.
Total Cost: $61,000.
Use of Building: On the first floor a water softening plant and dispensary; second floor, designing room for a rug mill.

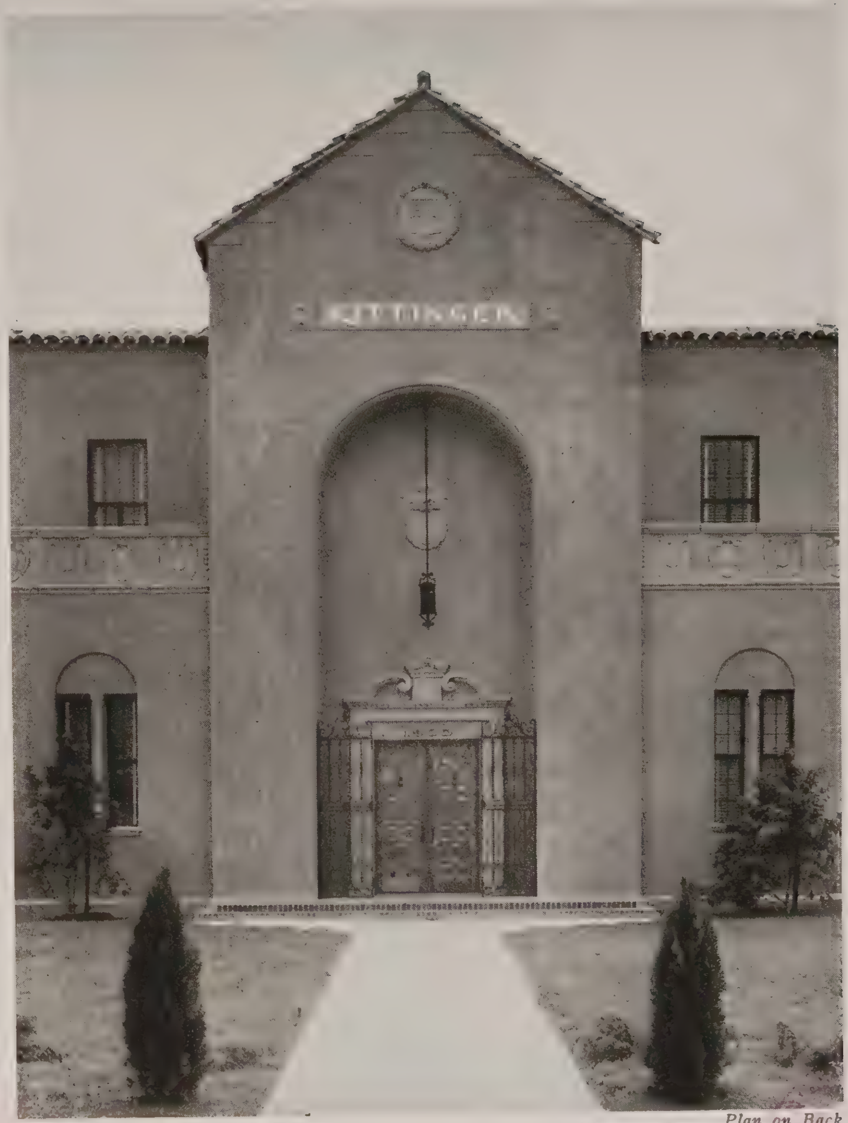


FIRST FLOOR

PLAN. BUILDING FOR M. J. WHITTALL ASSOCIATES,
WORCESTER, MASS.
JOSEPH D. LELAND & COMPANY, ARCHITECTS



ENTRANCE, BUILDING FOR M. J. WHITTALL ASSOCIATES,
WORCESTER, MASS.
JOSEPH D. LELAND & COMPANY, ARCHITECTS

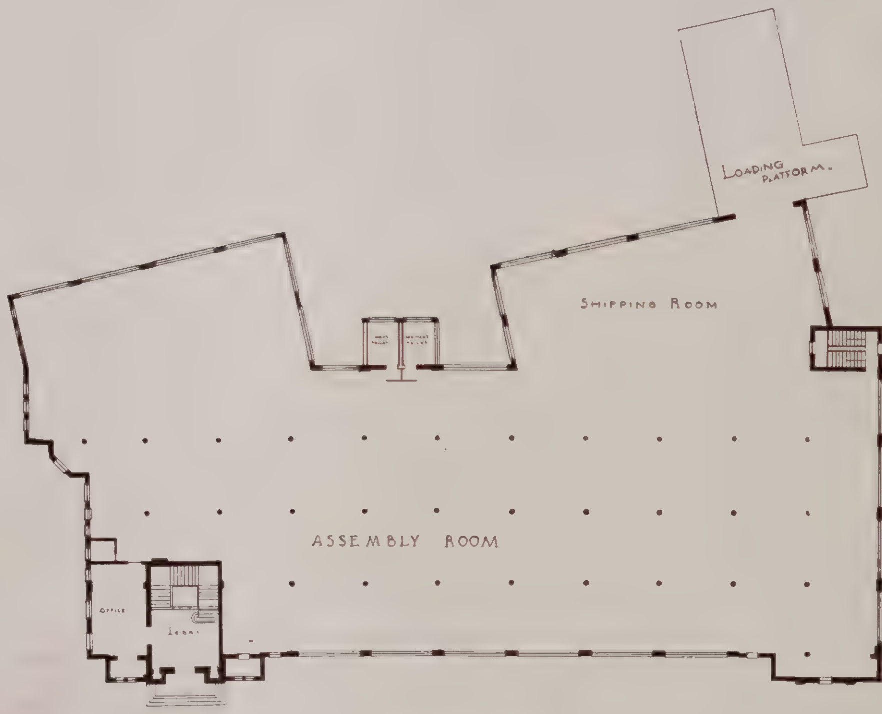


Plan on Back

ENTRANCE, BUILDING FOR THE KITTINGER COMPANY,
LOS ANGELES
DESIGNED BY THE KITTINGER COMPANY

COST AND CONSTRUCTION DATA

Year of Completion: 1929.
Type of Construction: Reinforced concrete; flat slab.
Exterior Materials: Concrete.
Interior Materials: Concrete.
Floors: Concrete.
Windows: Steel sash.
Lighting: Direct by drop cords.
Heating: Unit gas heaters.
Cubic Foot Cost: 21 cents.
Total Cost: $100,000.
Use of Building: Manufacturing, storage and show rooms for furniture.



FIRST FLOOR

PLAN. BUILDING FOR THE KITTINGER COMPANY, LOS ANGELES
DESIGNED BY THE KITTINGER COMPANY

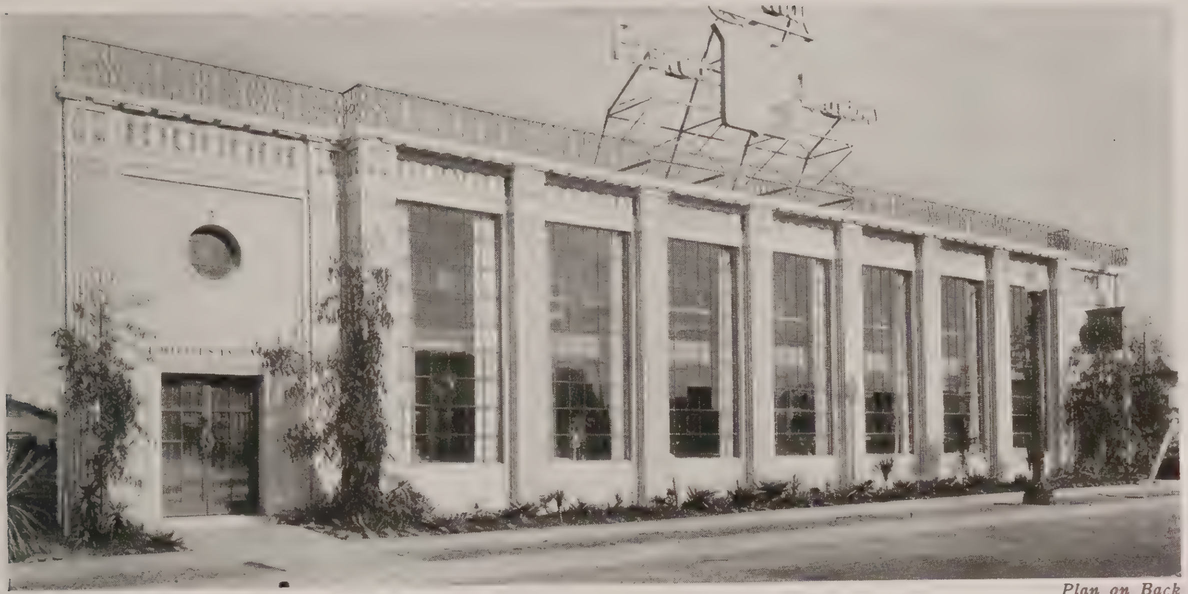
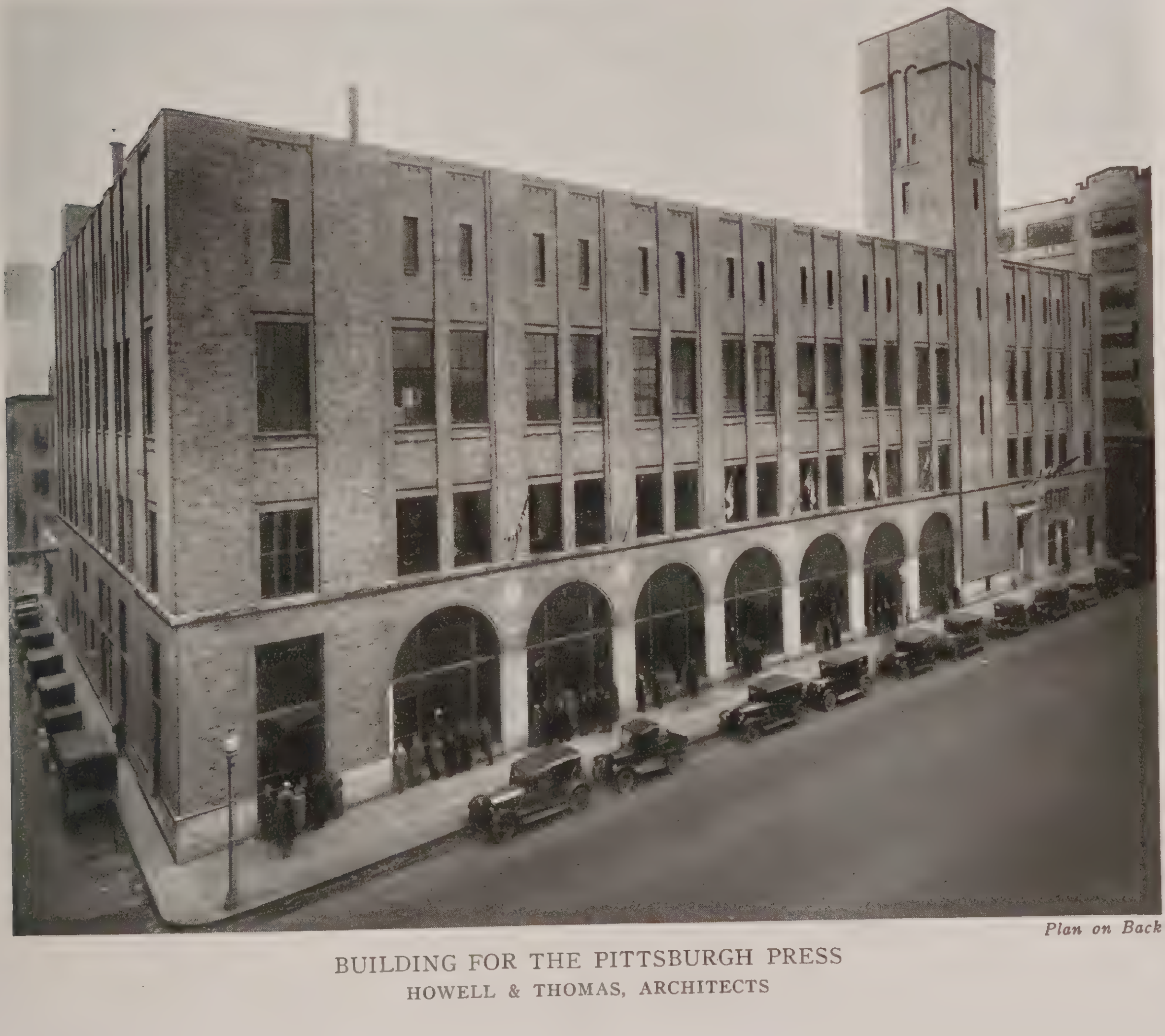


Photo. The Fitch Studio

Plan on Back

BUILDING FOR ORIGINAL FRENCH LAUNDRY, SAN DIEGO
FRANK P. ALLEN, ARCHITECT

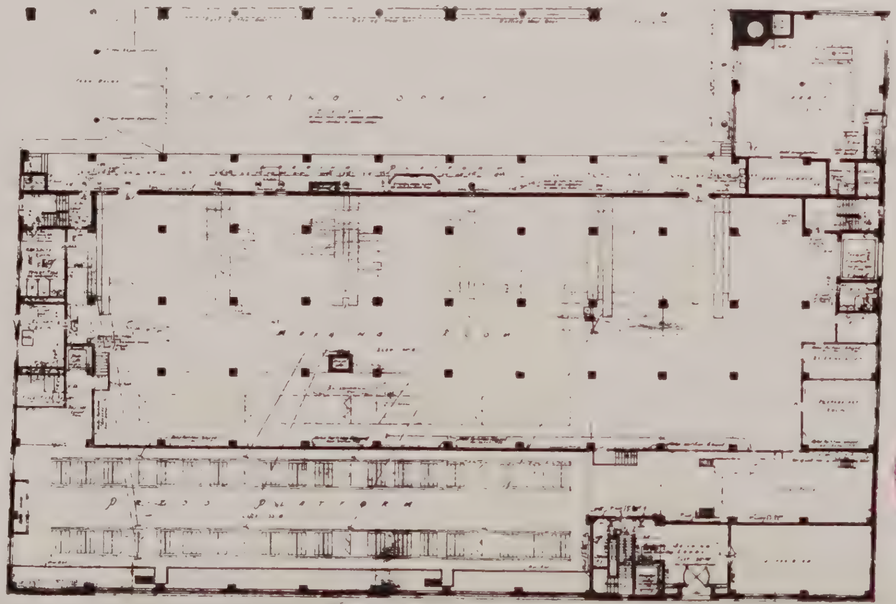


Plan on Back

BUILDING FOR THE PITTSBURGH PRESS
HOWELL & THOMAS, ARCHITECTS

COST AND CONSTRUCTION DATA

Year of Completion: 1927.
Type of Construction: Steel frame; hollow tile floor arches; fireproof throughout.
Exterior Materials: Brick.
Floors: Mechanical rooms, wood block; offices, rubber tile.
Windows: Metal.
Lighting: Semi-direct.
Heating: Steam.
Ventilating: Forced air and discharge.
Cubic Foot Cost: 70 cents.
Total Cost: $1,750,000.
Use of Building: Newspaper publishing plant.



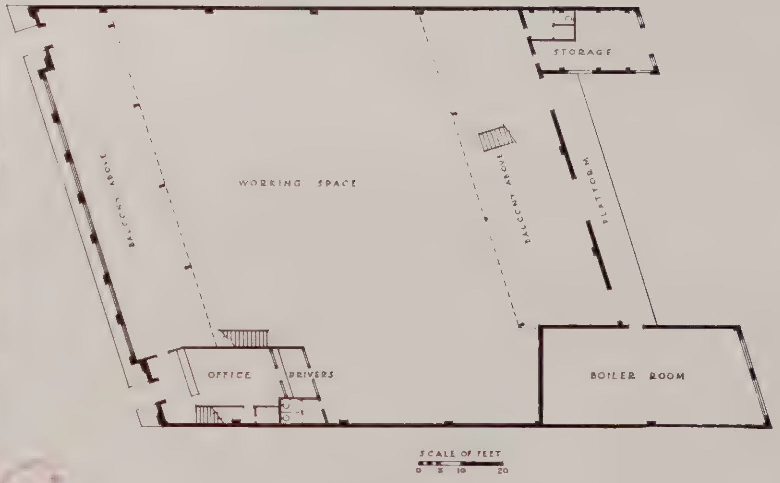
FIRST FLOOR

PLAN. BUILDING FOR THE PITTSBURGH PRESS

HOWELL & THOMAS, ARCHITECTS

CONSTRUCTION DATA

Type of Construction: Concrete.
Exterior Materials: Cement and tile.
Floors: Concrete and wood.
Windows: Steel sash.
Use of Building: Laundry.



FIRST FLOOR

PLAN. BUILDING FOR ORIGINAL FRENCH LAUNDRY, SAN DIEGO

FRANK P. ALLEN, ARCHITECT

THE DESIGNING OF POWER STATIONS

BY

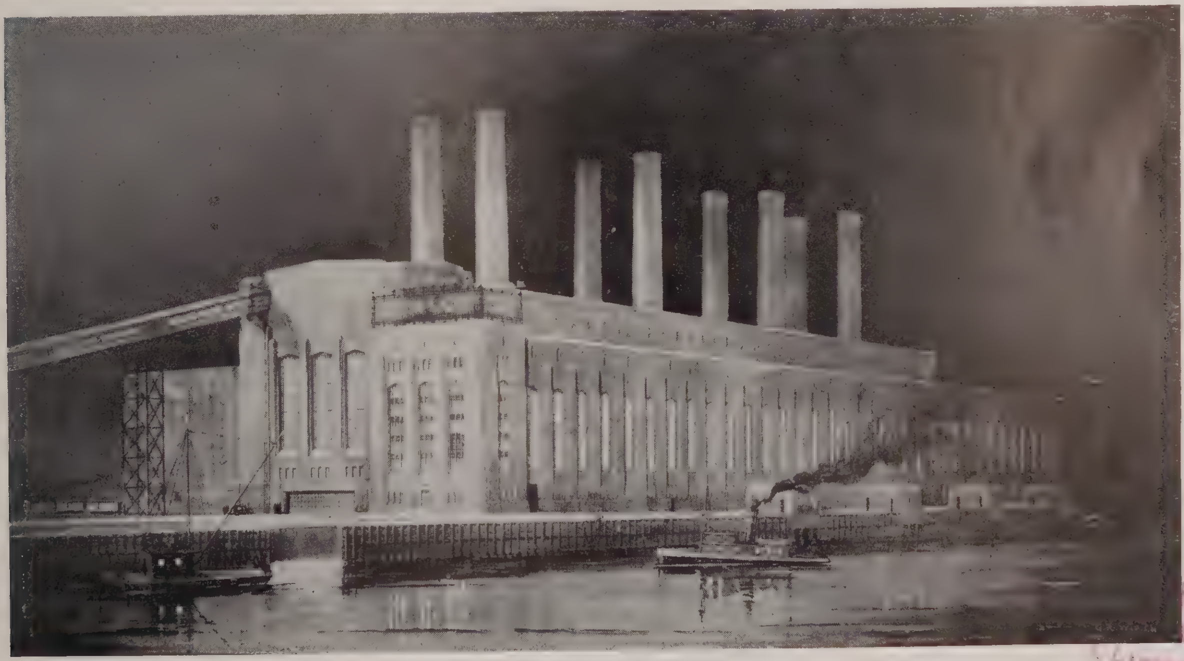
DONALD DES GRANGES

AFTER all the great wars in history, the victors have grown to recognize their power, their abilities, and their capacities for conquering in fields other than that of war. Since the Great War, we in this country have been progressing as was never even dreamed of prior to that catastrophic event, as is evidenced in our great commercial development, our recent vast business consolidations and unification of public utilities to better serve the public. These latter have brought into being central power plants on a scale and magnitude never before conceived. These great structures from 100 to 150 feet high and a thousand feet long are designed to generate electricity up to hundreds of thousands of kilowatts.

These buildings naturally have a tremendous influence upon the communities in which they are located; they, like great railroad terminals, are being looked upon as institutions of public service. Therefore, a certain architectural dignity to give the impressiveness demanded of semi-public buildings is being required. And a civic consciousness is being developed among some of the public utilities, so that they not only take pride in their buildings, but in the layout of their grounds and outlying buildings and develop park-like surroundings which add very materially to the good impression which the public has of these large corporations. If the buildings are located in remote locations, as hydroelectric stations frequently are, the beauty of the surroundings alone calls for beauty and dignity in the buildings.

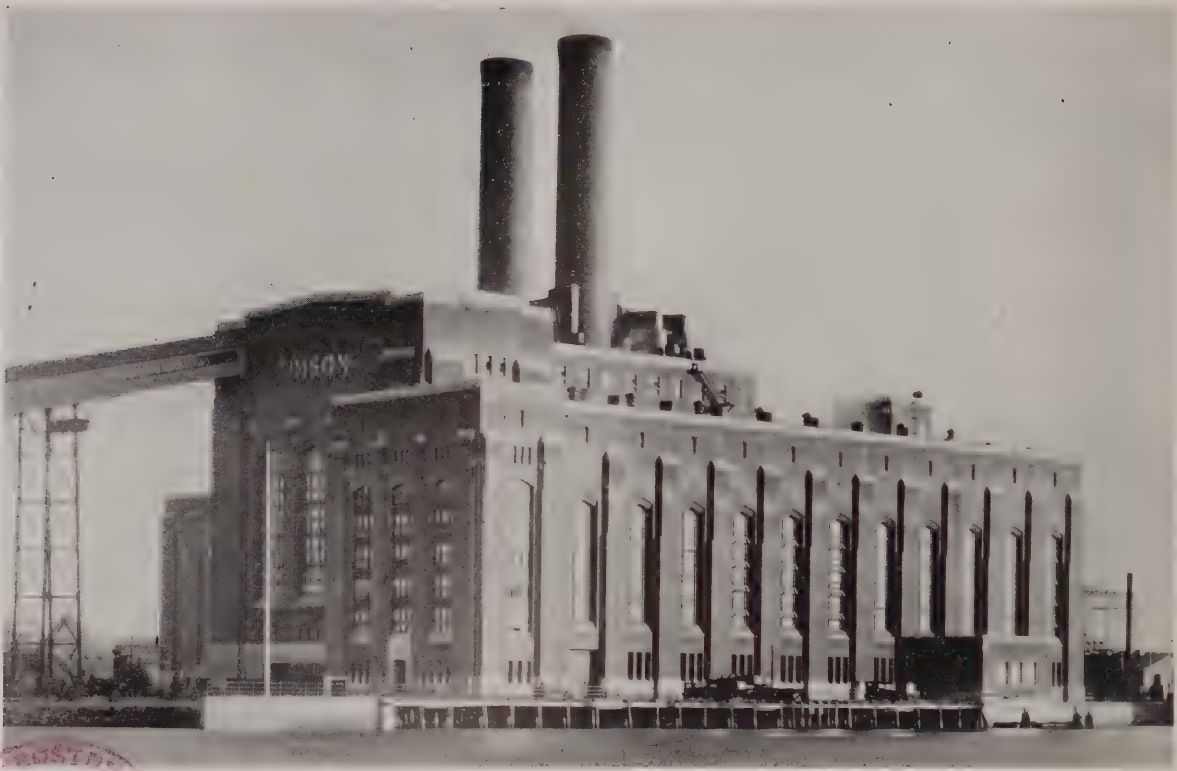
The use and the functions of modern power stations are totally different from those of any other buildings that have come down through history. There is nothing that has even remotely paralleled these structures in use or design. These modern buildings are intended to house huge machines and few people, to protect from the elements forces that are stupendous and superhuman. Thus the scale of these buildings must be adapted to the mechanical equipment, to machines which sometimes require a clear room height of 100 feet; to machines, some parts of which require the use of cranes which can lift 300 tons; to other machines which are operating at extremely high pressure. There is a feeling of grandeur and of poetry and of beauty in the orderly assembly of this modern, efficient and economical equipment, and it acts as a stimulant and an inspiration to the designer of the structure which houses it.

A power plant should reflect the life of today, for it is designed to supply needs in that life, needs that never arose in any previous civilization. What decoration may be used must be planned to meet exactly the problems which they



Proposed Ultimate Development, Charles Leavitt Edgar Station, No. Weymouth, Mass.

Edison Electric Illuminating Co. of Boston
Stone & Webster Engineering Corp., Engineers and Constructors
Bigelow & Wadsworth, Consulting Architects



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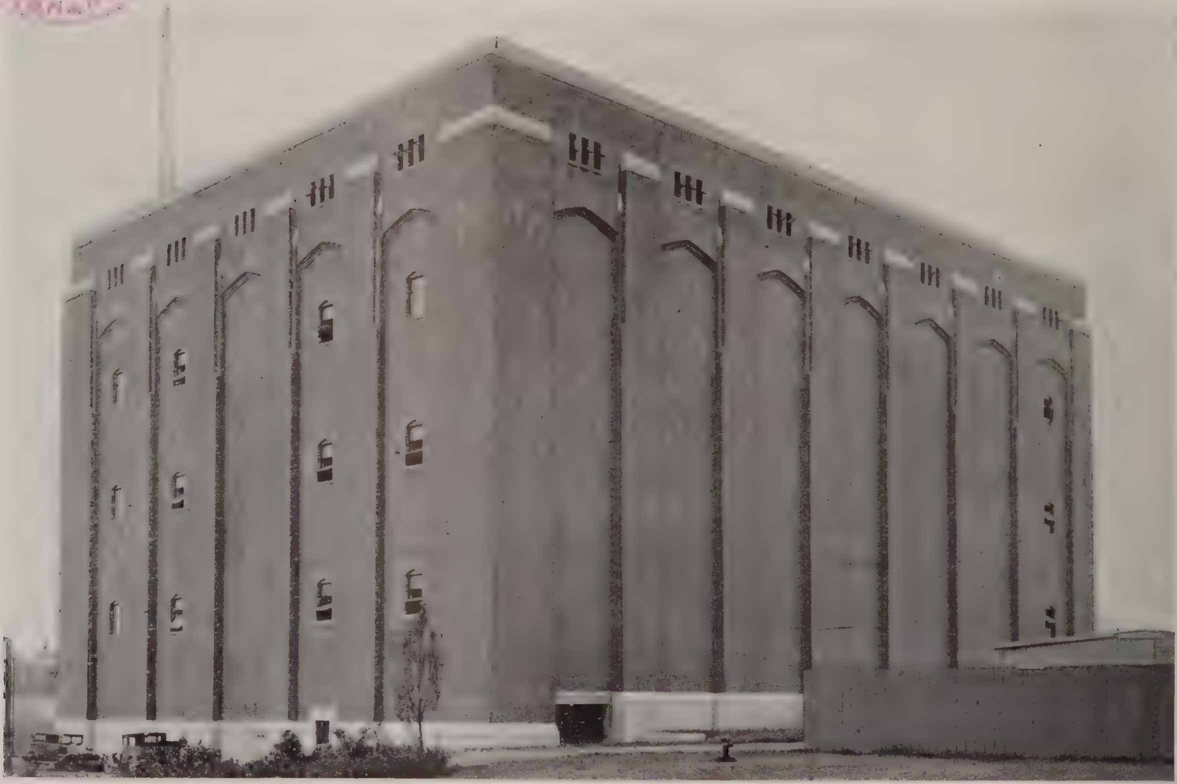
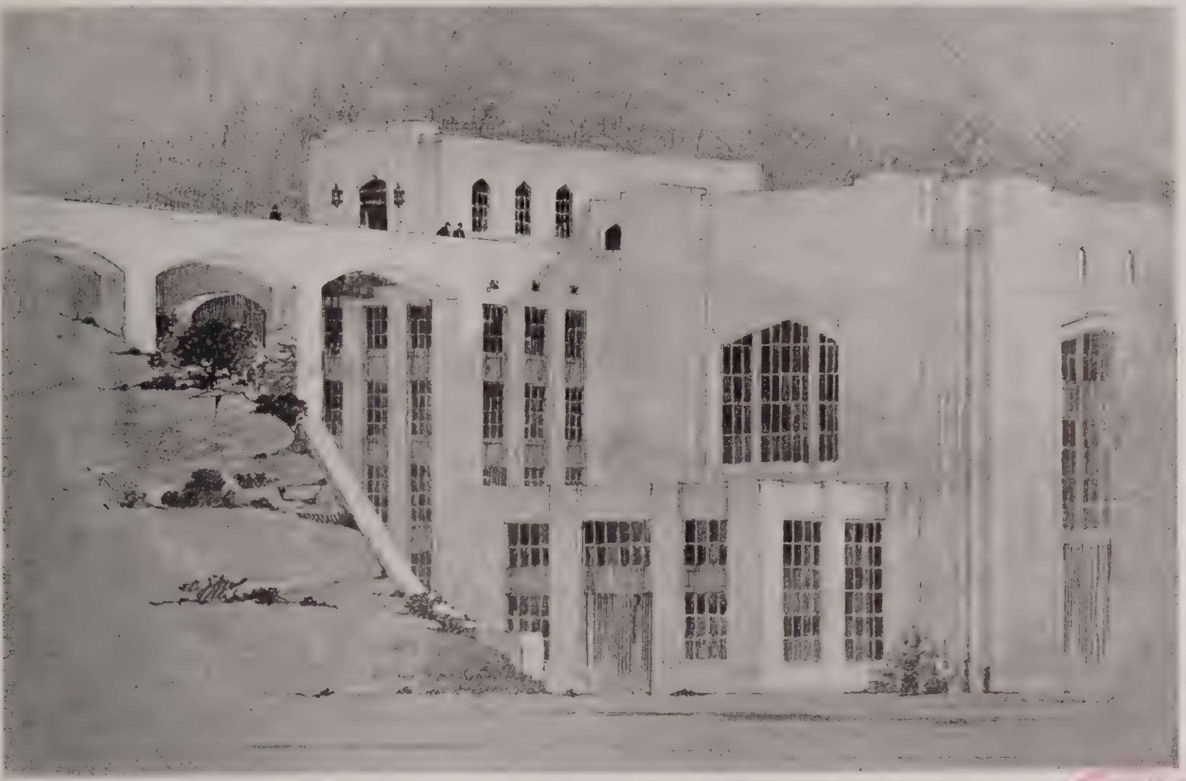
GENERAL VIEW



SWITCH HOUSE

CHARLES LEAVITT EDGAR STATION, NO. WEYMOUTH, MASS.
EDISON ELECTRIC ILLUMINATING CO. OF BOSTON
STONE & WEBSTER ENGINEERING CORP., ENGINEERS AND CONSTRUCTORS
BIGELOW & WADSWORTH, CONSULTING ARCHITECTS



PERSPECTIVE STUDY OF OFFICE BAY

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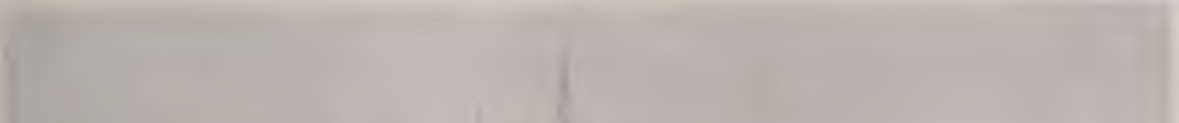

Courtesy of Stone & Webster Engineering Corporation

MAIN ENTRANCE AT HIGHWAY

HYDRO ELECTRIC DEVELOPMENT, SUSQUEHANNA POWER CO., CONOWINGO, MD.

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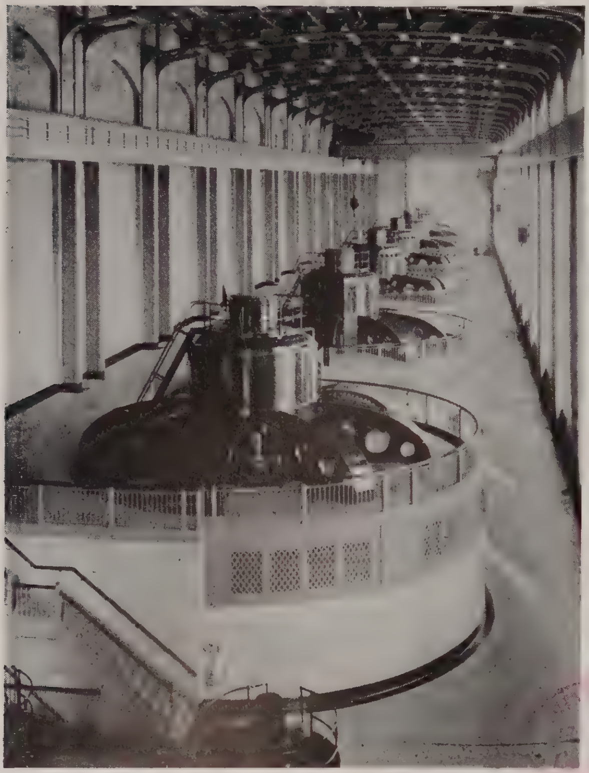
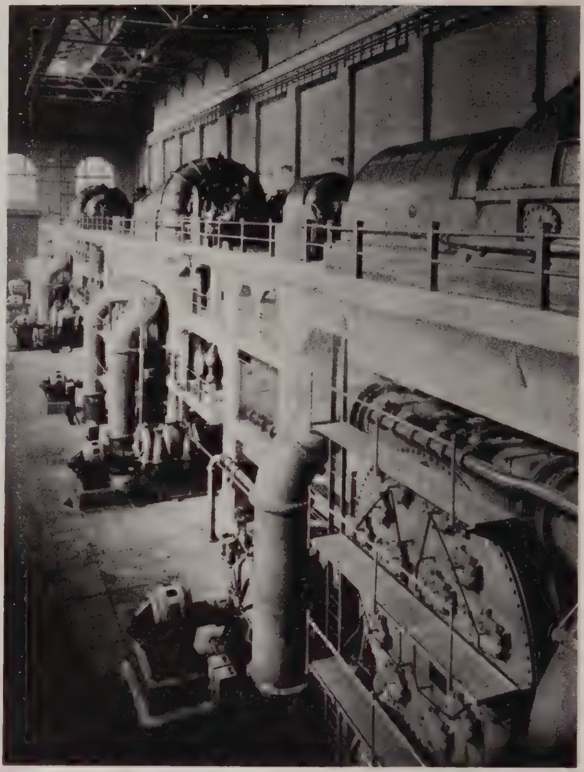
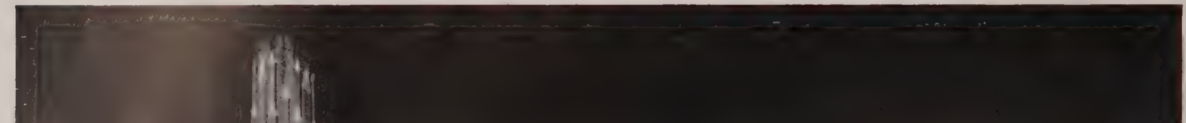


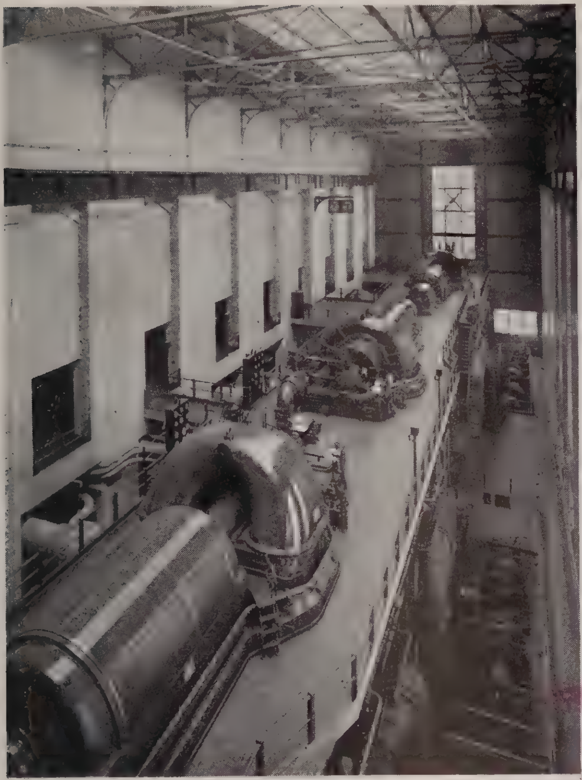
Courtesy of Stone & Webster Engineering Corporation
INTERIOR OF GENERATOR ROOM, HYDRO ELECTRIC DEVELOPMENT, SUSQUEHANNA POWER CO., CONOWINGO, MD.



Courtesy of Stone & Webster Engineering Corporation
INTERIOR OF TURBINE ROOM, STEAM PLANT NO. 2, SOUTHERN CALIFORNIA EDISON CO., LONG BEACH, CAL.



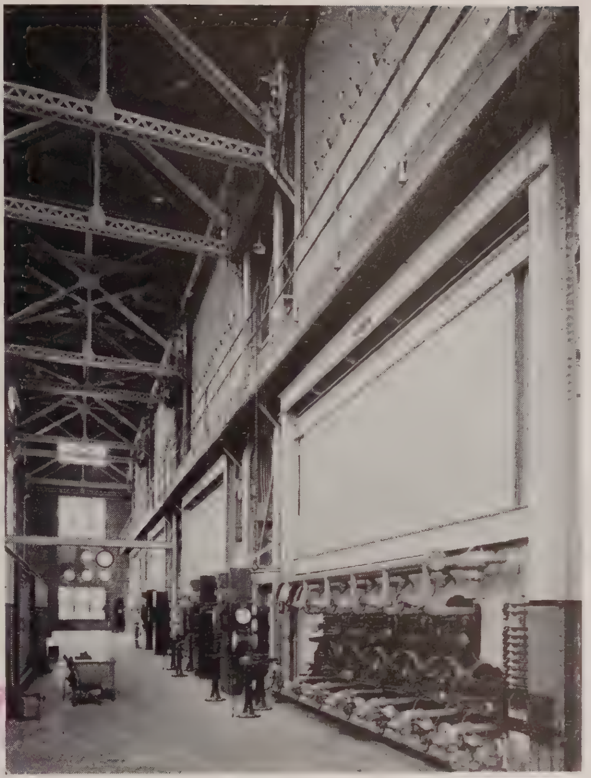
STACK HOUSE, ST. PAUL'S SCHOOL, CONCORD, N. H.
DAY & KLAUDER, ARCHITECTS



Courtesy of Stone & Webster Engineering Corporation

TURBINE ROOM, CHARLES LEAVITT EDGAR STATION, NO. WEYMOUTH, MASS.

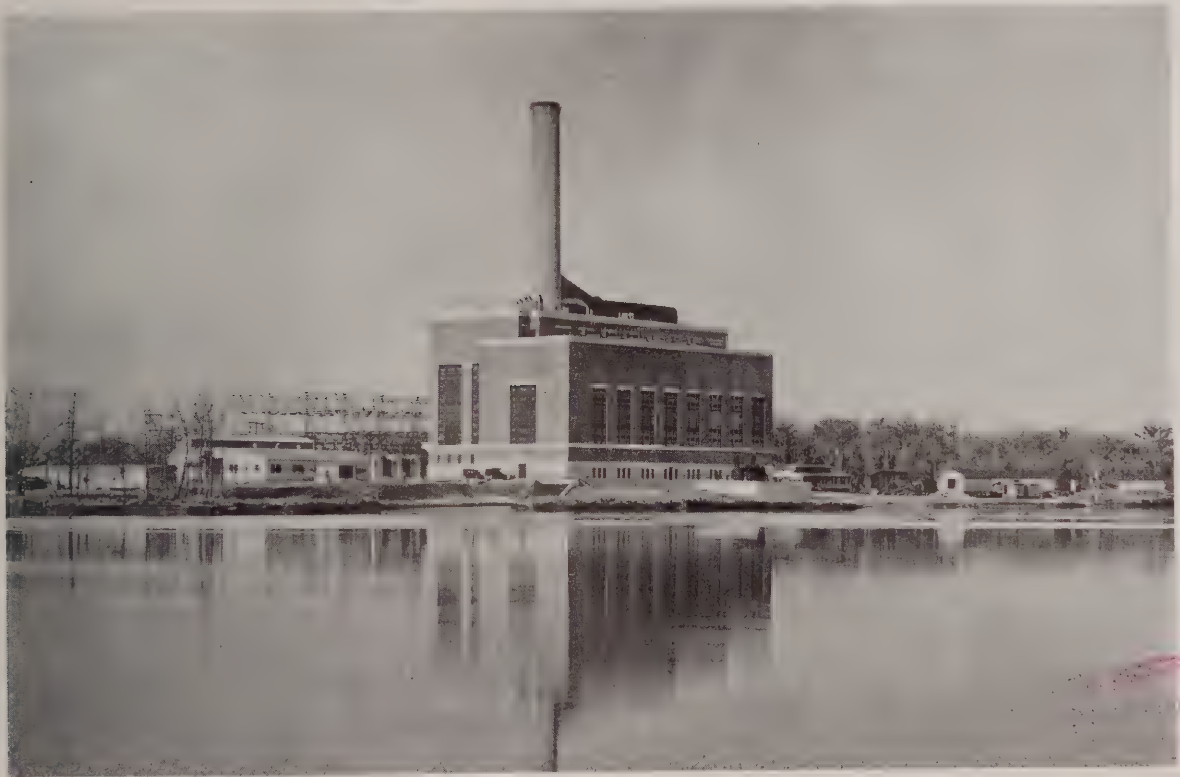
EDISON ELECTRIC ILLUMINATING CO. OF BOSTON



Courtesy of Stone & Webster Engineering Corporation

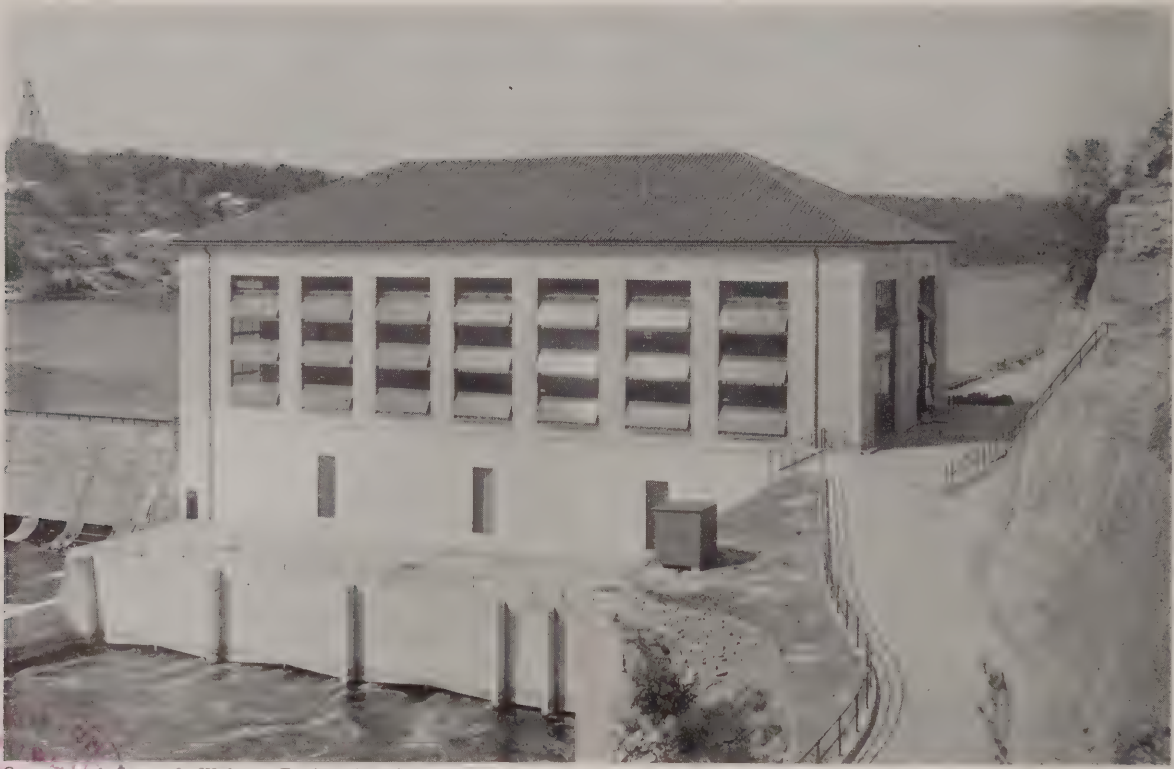
INTERIOR OF BOILER ROOM, NECHES POWER STATION

GULF STATES UTILITIES CO., BEAUMONT, TEX.



Courtesy of Stone & Webster Engineering Corporation

NECHES POWER STATION, GULF STATES UTILITIES CO., BEAUMONT, TEX.

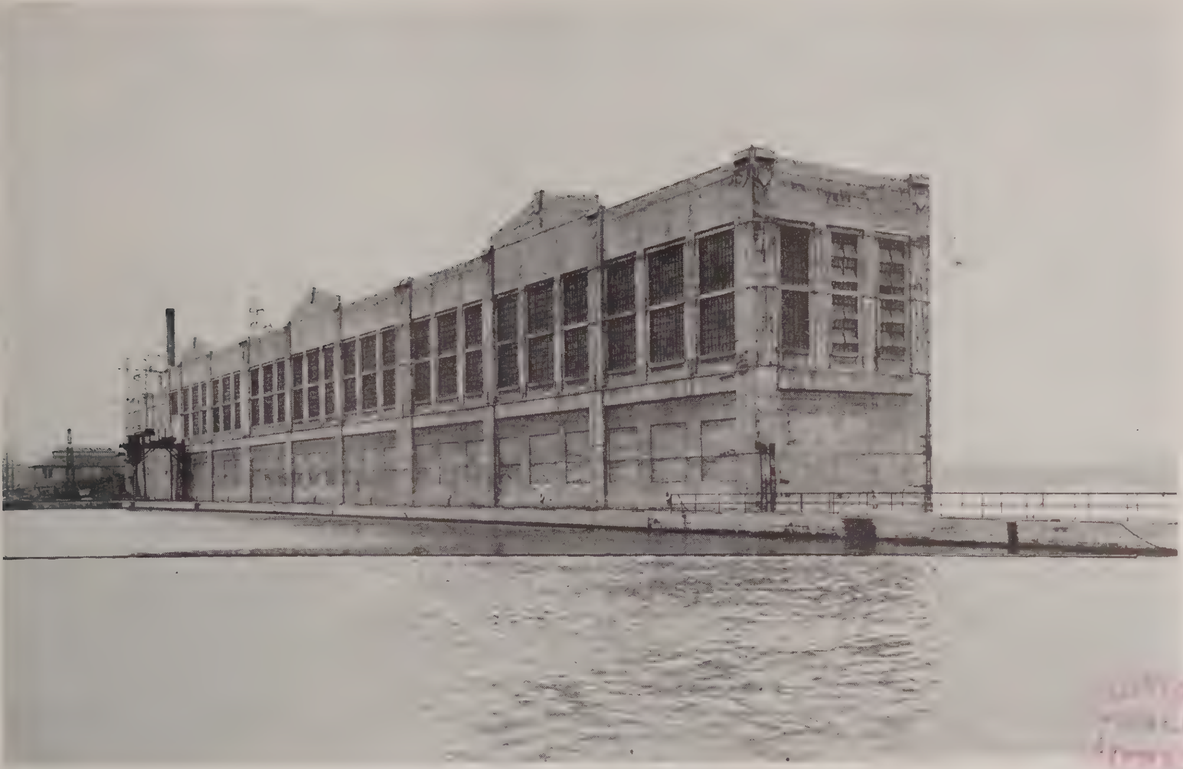


Courtesy of Stone & Webster Engineering Corporation

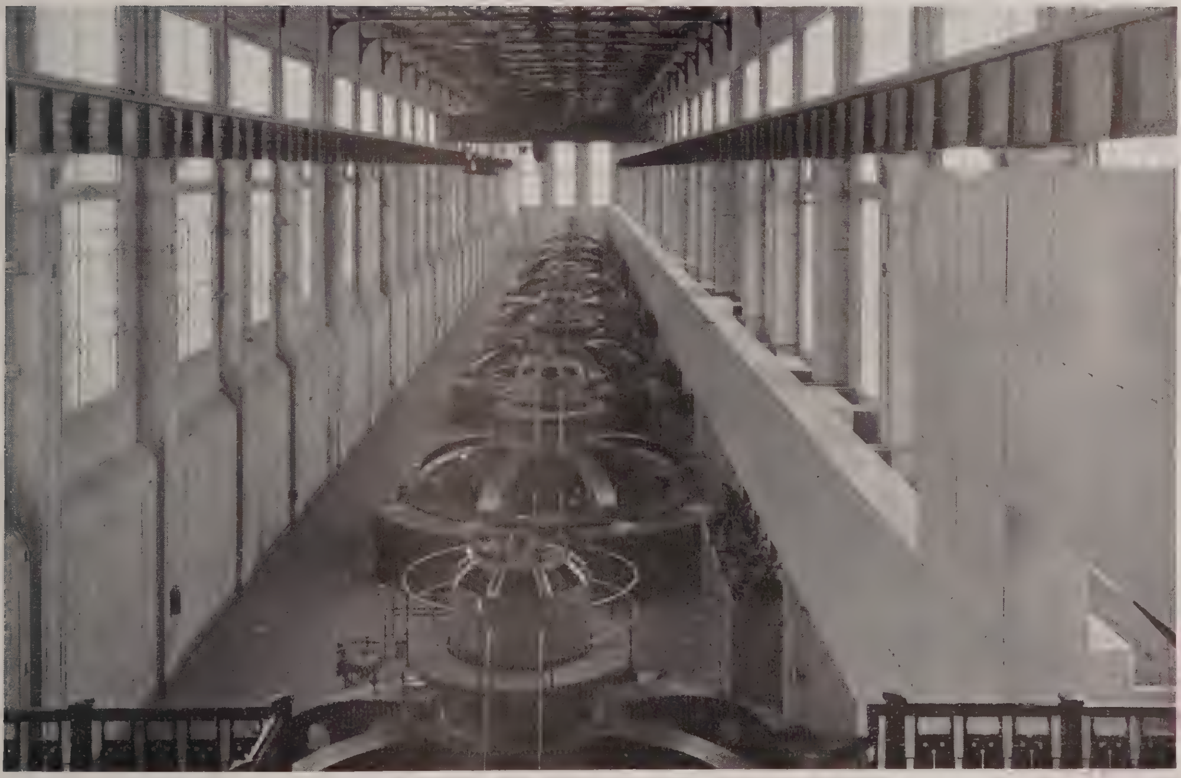
TWIN CITIES HYDRO ELECTRIC PLANT, FORD MOTOR COMPANY, ST. PAUL

Courtesy of Stone & Webster Engineering Corporation

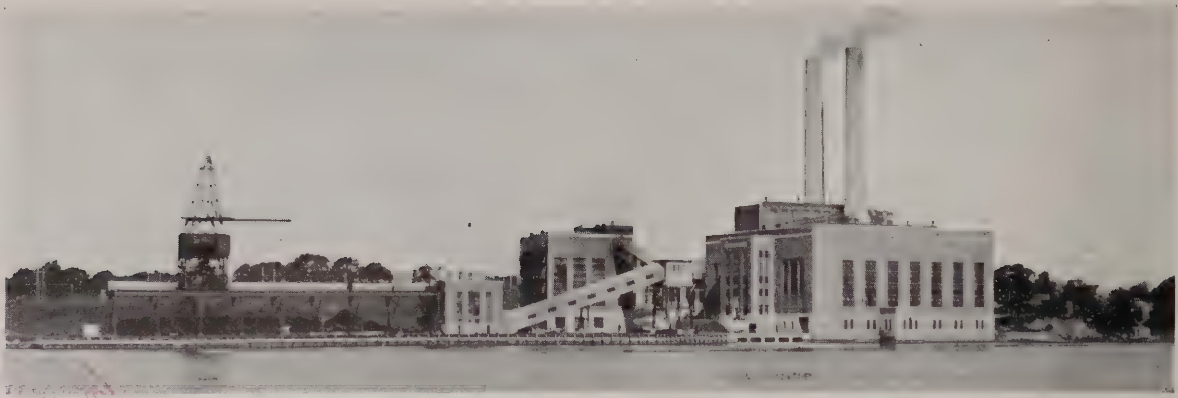
TWIN CITIES STEAM PLANT, FORD MOTOR CO., ST. PAUL



EXTERIOR VIEW

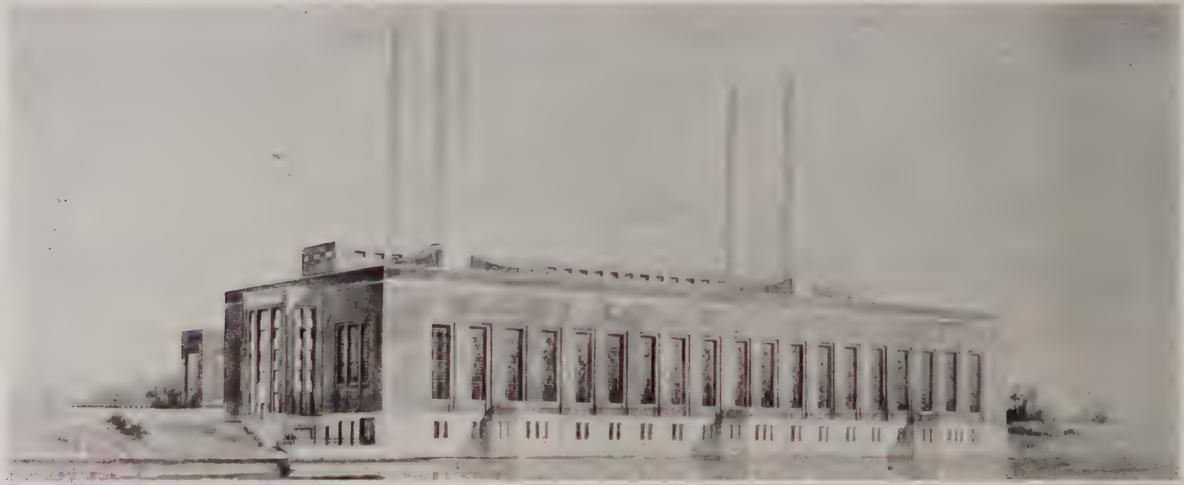


INTERIOR, OHIO FALLS HYDRO STATION, LOUISVILLE GAS & ELECTRIC CO.
BYLLESBY ENGINEERING & MANAGEMENT CORPORATION, ENGINEERS



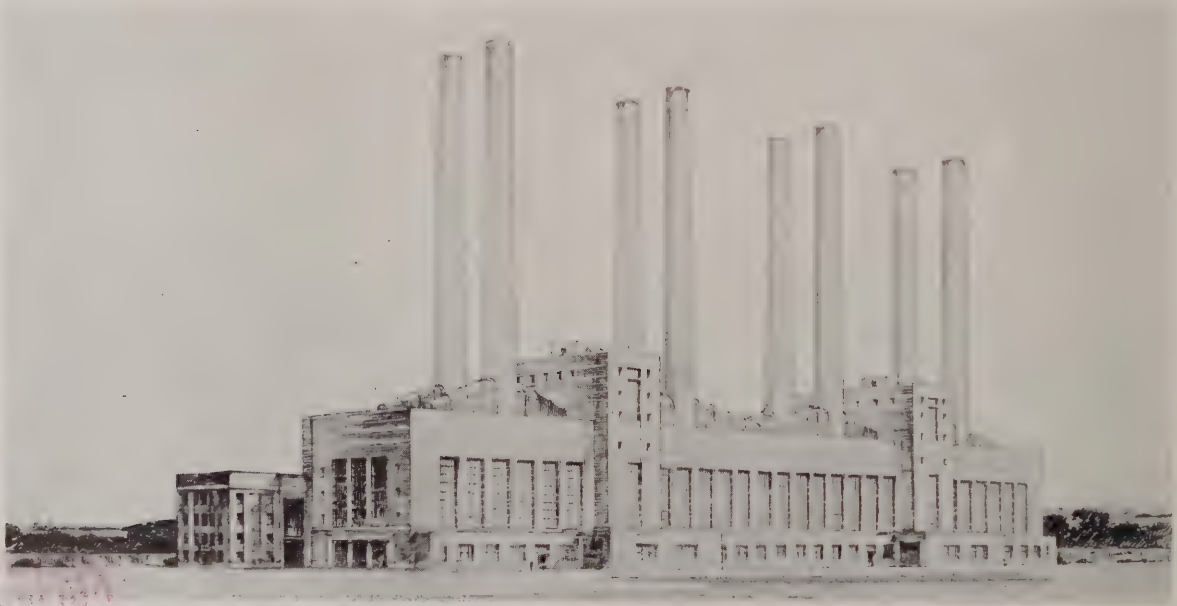
Courtesy of Stone & Webster Engineering Corporation

SOMERSET POWER STATION, MONTAUP ELECTRIC CO., SOMERSET, MASS.



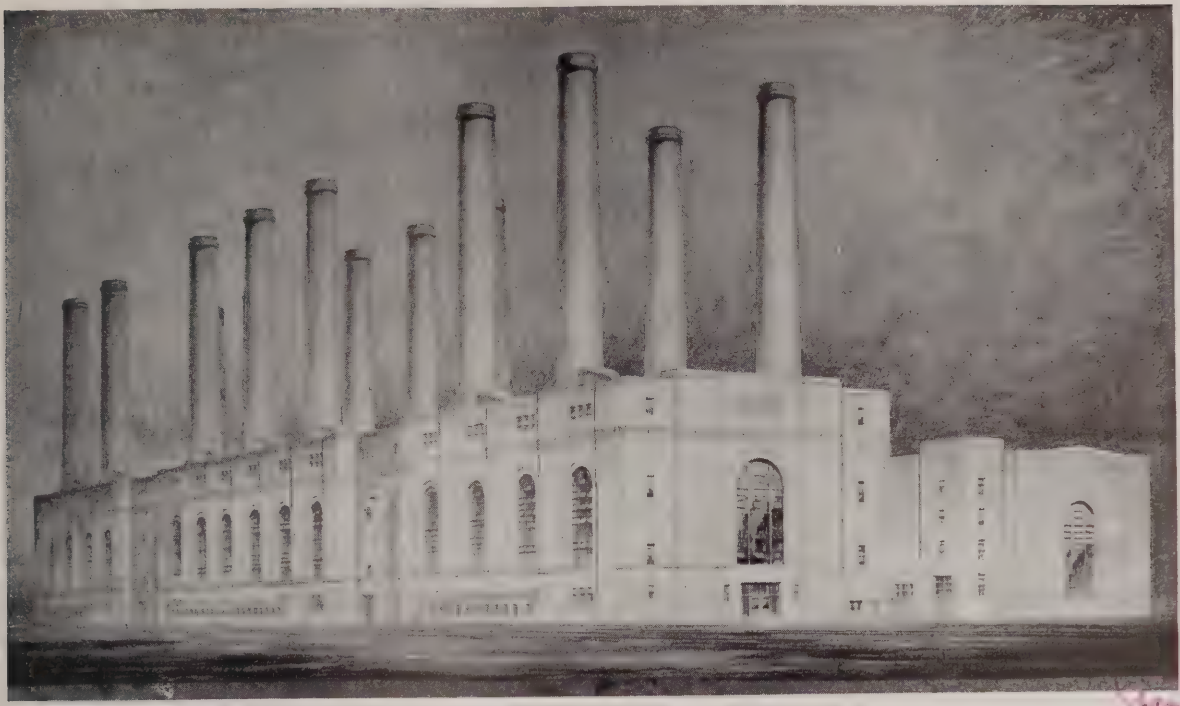
Courtesy of Stone & Webster Engineering Corporation

PERSPECTIVE OF ULTIMATE DEVELOPMENT, SOMERSET POWER STATION, MONTAUP ELECTRIC CO., SOMERSET, MASS.

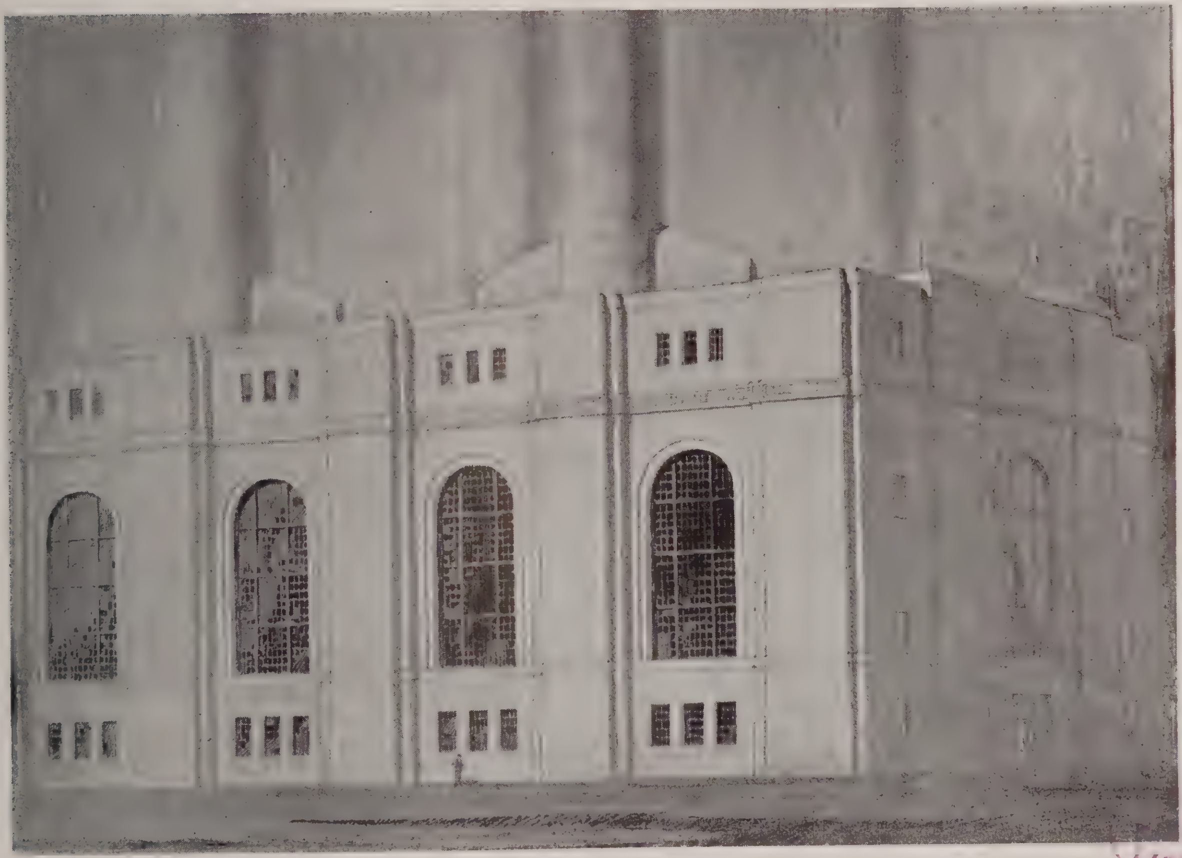


Courtesy of Stone & Webster Engineering Corporation

PERSPECTIVE OF ULTIMATE DEVELOPMENT, POWER STATION, LUZERNE COUNTY GAS & ELECTRIC CORPORATION, HEMLOCK CREEK, PA.



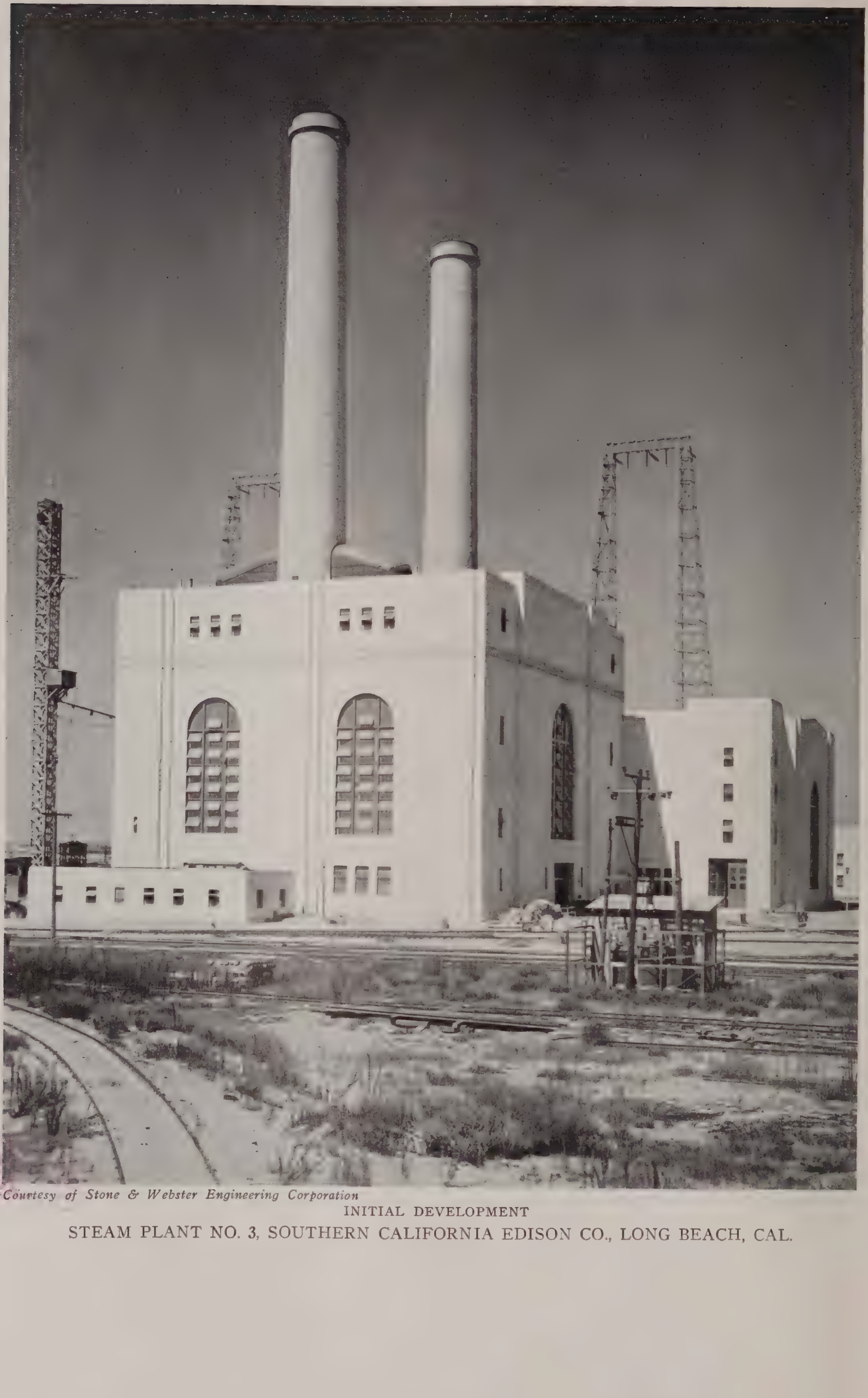
PERSPECTIVE OF ULTIMATE STATION



Courtesy of Stone & Webster Engineering Corporation

STUDY OF EXTERIOR DETAILS

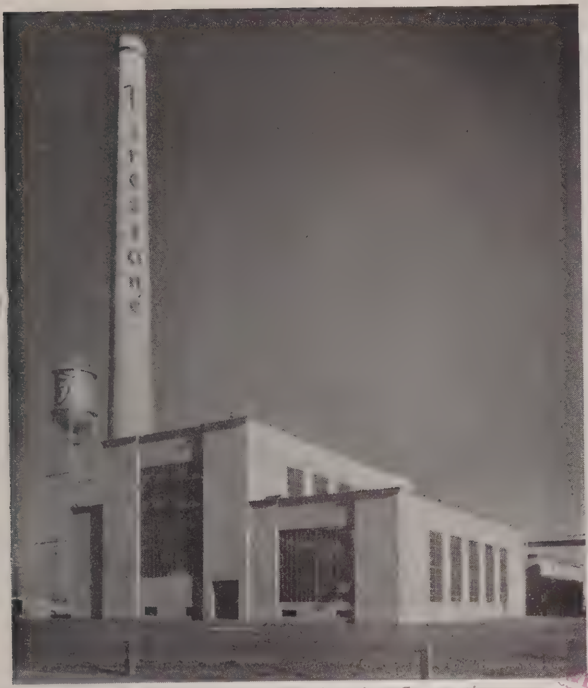
STEAM PLANT NO. 3, SOUTHERN CALIFORNIA EDISON CO., LONG BEACH, CAL.



Courtesy of Stone & Webster Engineering Corporation

INITIAL DEVELOPMENT

STEAM PLANT NO. 3, SOUTHERN CALIFORNIA EDISON CO., LONG BEACH, CAL.



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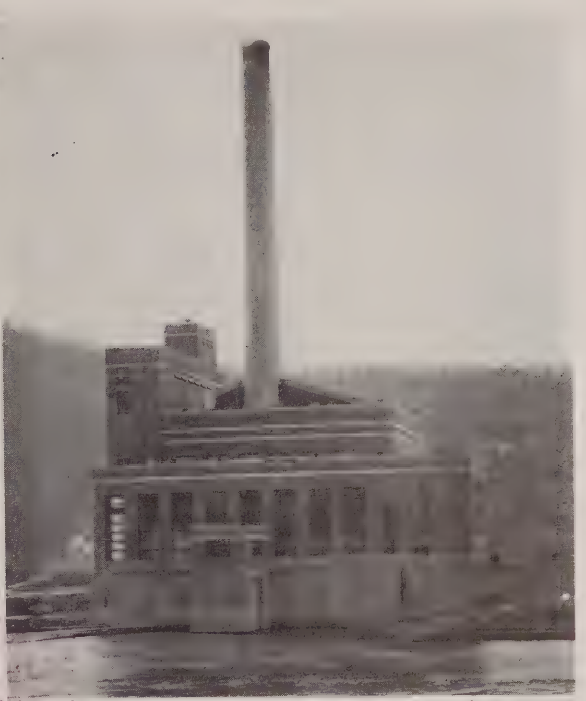
BOILER PLANT, FIRESTONE TIRE & RUBBER CO., LOS ANGELES



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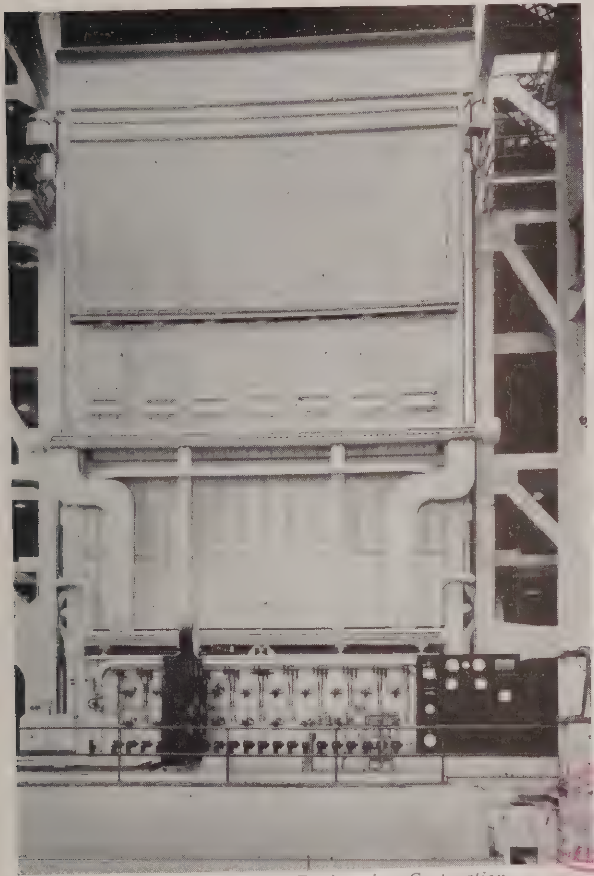
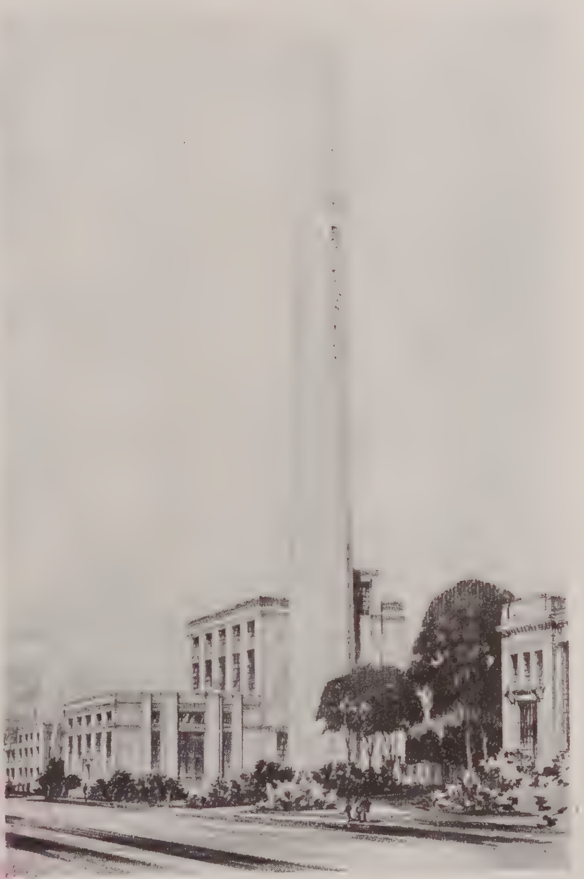
POWER STATION, LUZERNE COUNTY GAS & ELECTRIC CORP., HEMLOCK CREEK, PA.



Courtesy of Stone & Webster Engineering Corporation
INTERIOR OF BOILER ROOM, STEAM PLANT NO. 3, SOUTHERN CALIFORNIA EDISON CO., LONG BEACH, CAL.



POWER PLANT FOR BROWN & BIGELOW, ST. PAUL
TOLTZ, KING & DAY, INC., ARCHITECTS & ENGINEERS

Courtesy of Stone & Webster Engineering Corporation

Hydro Electric Development, Susquehanna Power Co., Conowingo, Md.

present. "True architecture is construction carried to the highest point of development without the necessary addition of any elements foreign to its own conditions of stability and strength. Structure cannot be elevated into the domain of art merely by the application of ornament." Decoration is no longer a need of this age as it was in the days before people could read and before there was much printing, for then decoration told a story, which is now told much better in other ways. We should depend today on mass, beauty of proportion, and relations of voids and solids together with texture and color to obtain the effects for which we are striving. The design then should be of the utmost simplicity in character. This likewise tends toward economy, which is an exceedingly important factor, for the money to build these stations comes from large numbers of people who expect to receive a return on their investment, while the cost of the light and power produced must be paid for by the great mass of the public who cannot afford to pay more than a reasonable price for the service they receive.

Besides simplicity of design, an attempt should be made to express strength,—that is power,—and where the limitations of the mechanical and structural designs are not too great, at times real beauty can be secured. Yet one of the deterring factors in obtaining beauty is the piecemeal fashion in which these stations must often be built. At the same time it necessarily influences the design of the whole, for the building must be chopped off at any point which will satisfactorily house the equipment then being installed, since the stations are designed merely to meet the load requirements for an estimated period of time. Similarly, it is practically impossible to anticipate the ultimate size of any given plant. The design of mechanical and electrical equipment is changing so rapidly, new principles are being discovered, new economies are being found,—that a station which is modern today may in a few years be entirely out of date, or it may be too small to contain newly designed equipment, thus demanding the establishment of a new plant, or the complete redesigning of the additions.

The dominating influence of mechanical and electrical features upon the architectural design should be apparent. The elements of this equipment must be related in the most advantageous manner to produce steam and electricity at the lowest cost. The design of the building must not interfere with the perfect coördination of turbine with condenser, of economizers and preheaters with the boilers, of atmospheric exhausts to go somewhere, and induced draft and exhaust fans which call for louvers many times larger than they should be for appearance, and cinder catchers that won't get under the roof; and then the loads of the structure and its equipment and its chimneys all carried in the beams and girders and columns do not leave much opportunity for design.

However, with all these limitations, the coöperation of the engineers and architects, with the hearty assistance of clients, is permitting definite advancement in the designing of power plants. That this is now being done is amply demonstrated in every part of the country. Countless excellent examples of such buildings are being constantly illustrated in the architectural publications, and not a few are shown in this number of The Architectural Forum, devoted as it is exclusively to industrial structures. Mere size of itself possesses but little interest, but when to size there are added fine and simple lines and well studied proportions, and when use has been made of appropriate materials, there comes a grace or rhythm which constitutes beauty in a high degree.

ARCHITECT VERSUS ENGINEER

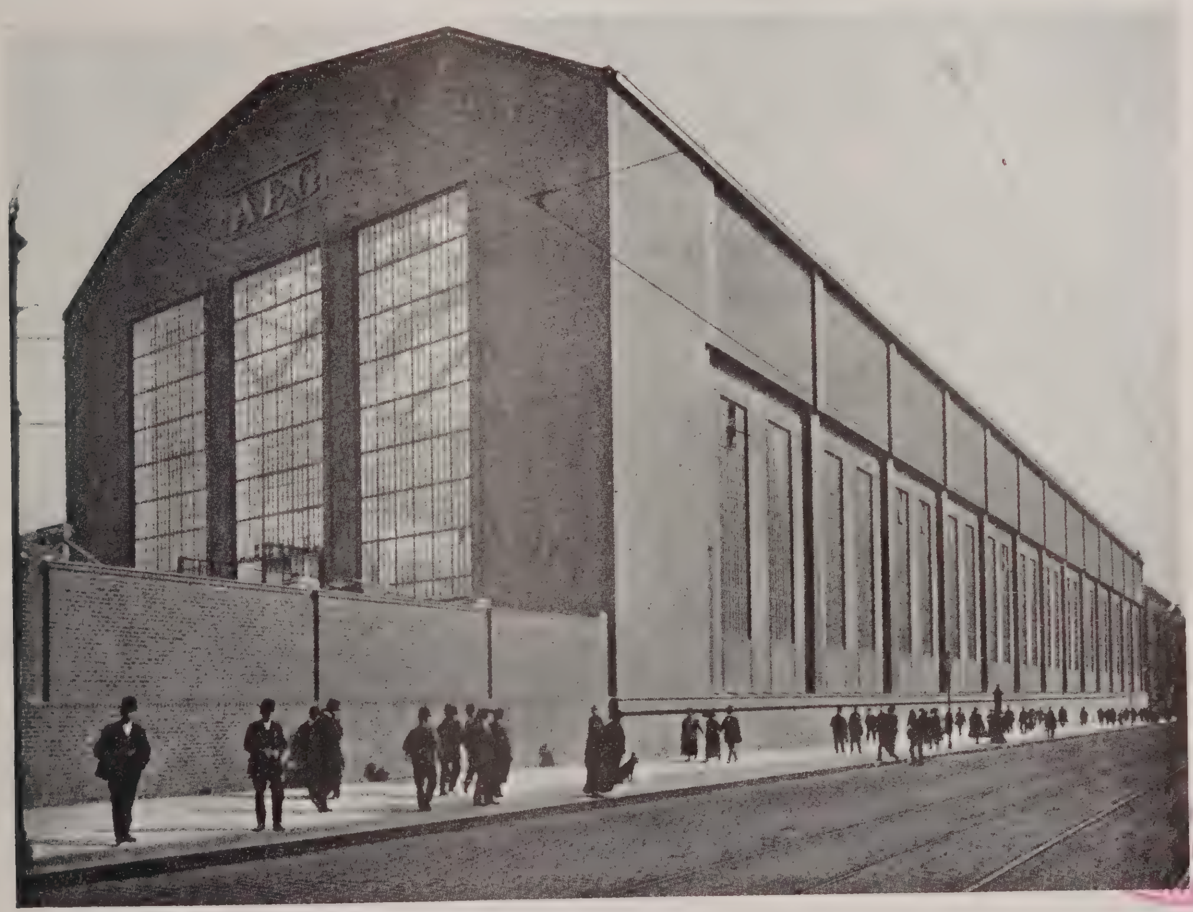
BY

SHEPARD VOGELGESANG

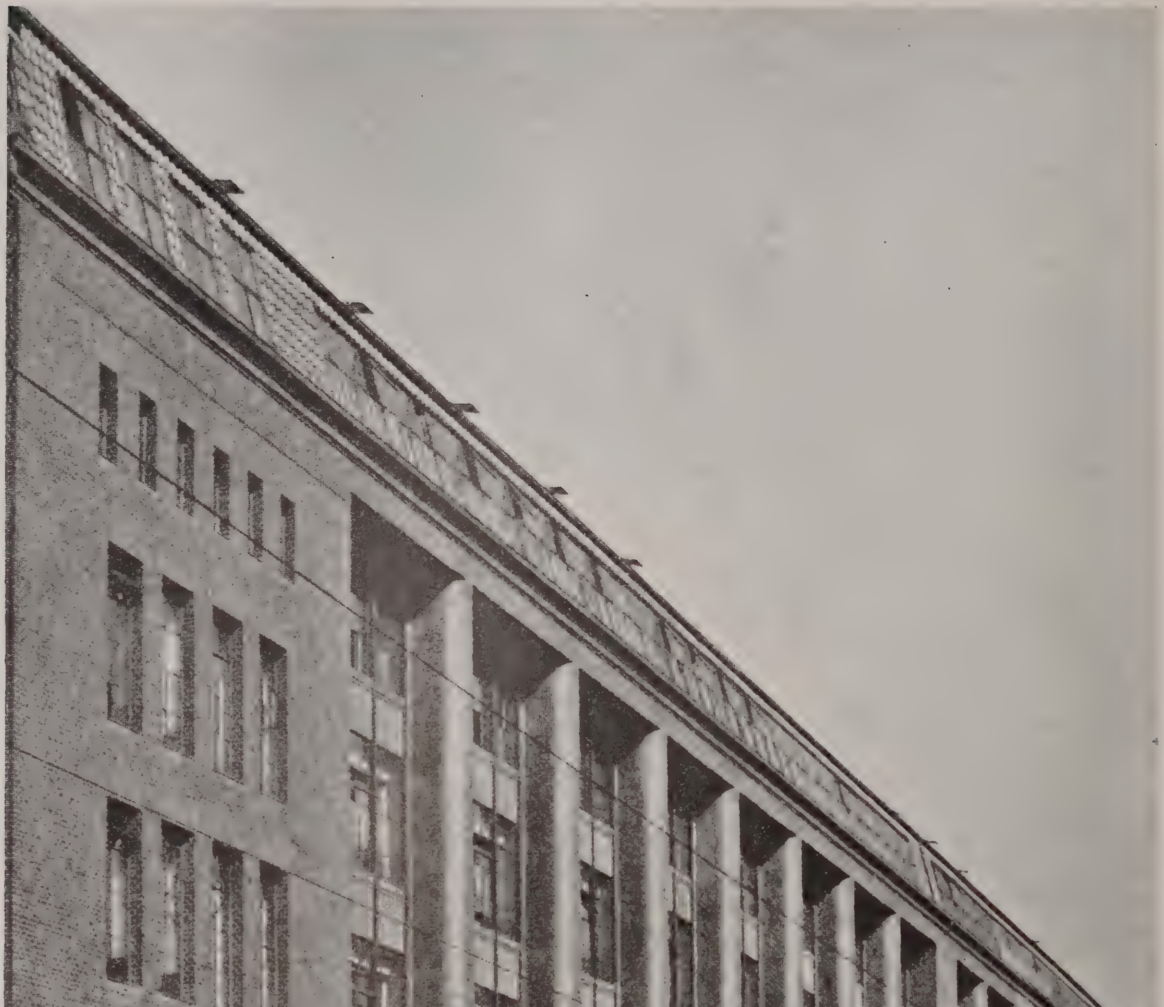
BEING A SUMMARY OF THE BOOK "ARCHITEKT UND INGENIEUR" BY FRITZ SCHUPP AND MARTIN KREMMER, BERLIN, 1929

OCCASIONALLY the American architect is challenged by the opportunity to do purely industrial work. More often an engineer alone is employed, industrial building being considered by some beyond the compass of the architect's training. The point of view often held by engineers and manufacturers is that an architect is all right if you want to dress things up, but otherwise why employ one? It is for this reason that an opportunity to do industrial work comes as a challenge to the architect. This attitude,—that an architect is hired to put frippery on an otherwise complete structure,—strikes at the very foundations of the architect's service. Architecture is not millinery or, as the Germans say, "hair dressing"; it is the art and science of orderly arrangement plus a sense for beauty.

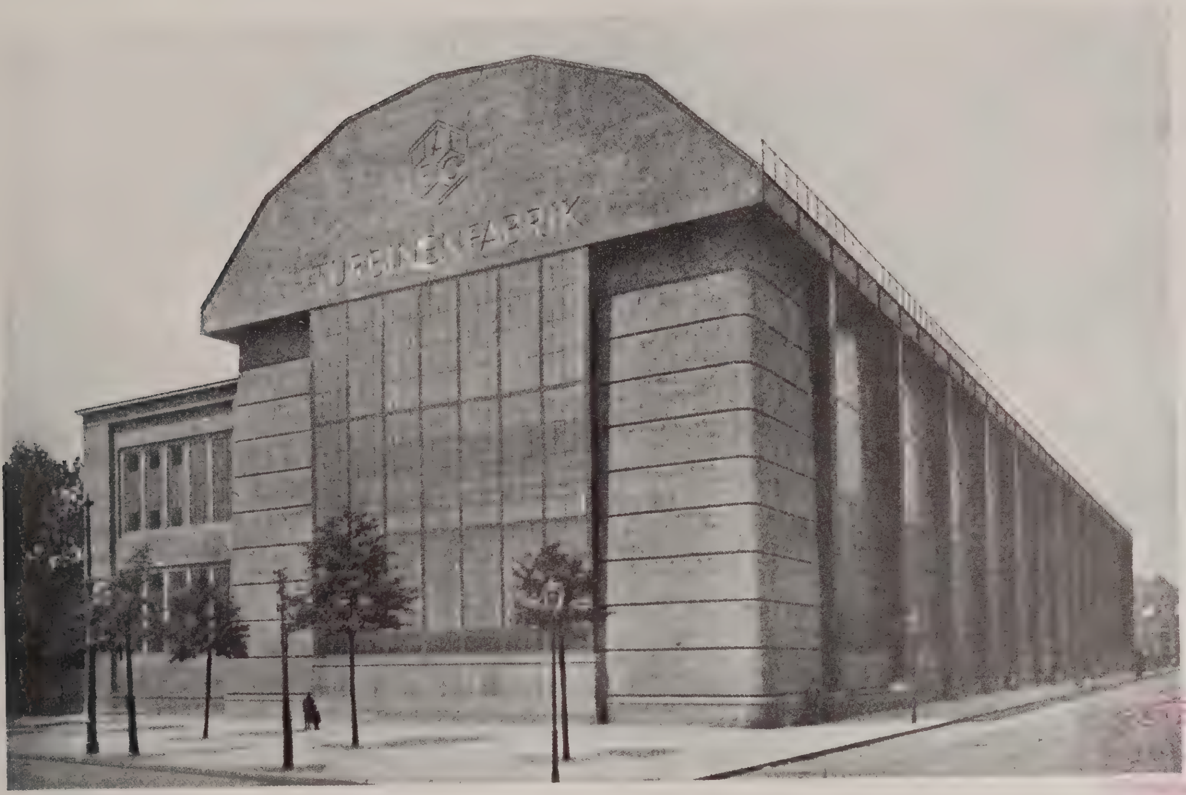
The architectural sense for beauty is not bound up in ornament. A building may be bare and yet architecturally beautiful through proportions, rhythm and material. As the degree of sensibility of the architect to proportion, rhythm and material is high, so high will the architectural worth of the building be. It is hard to find in America buildings more beautiful than some early colonial work which often presents only these primal elements of architectural beauty unornamented. Architecture is more than right structure, it is building related to human needs, the need for interest in arrangement, the right degree of uniformity, the right break in monotony, the friendly climate indoors supplanting the hostile elements outside. The difference between planned architecture and mere building is like the difference between the movements of a trained and an untrained body. The difference between a skilled architect's management of building stuff and the mere use of the same materials is much the same as the difference between the polished brilliant and the uncut gem. At every



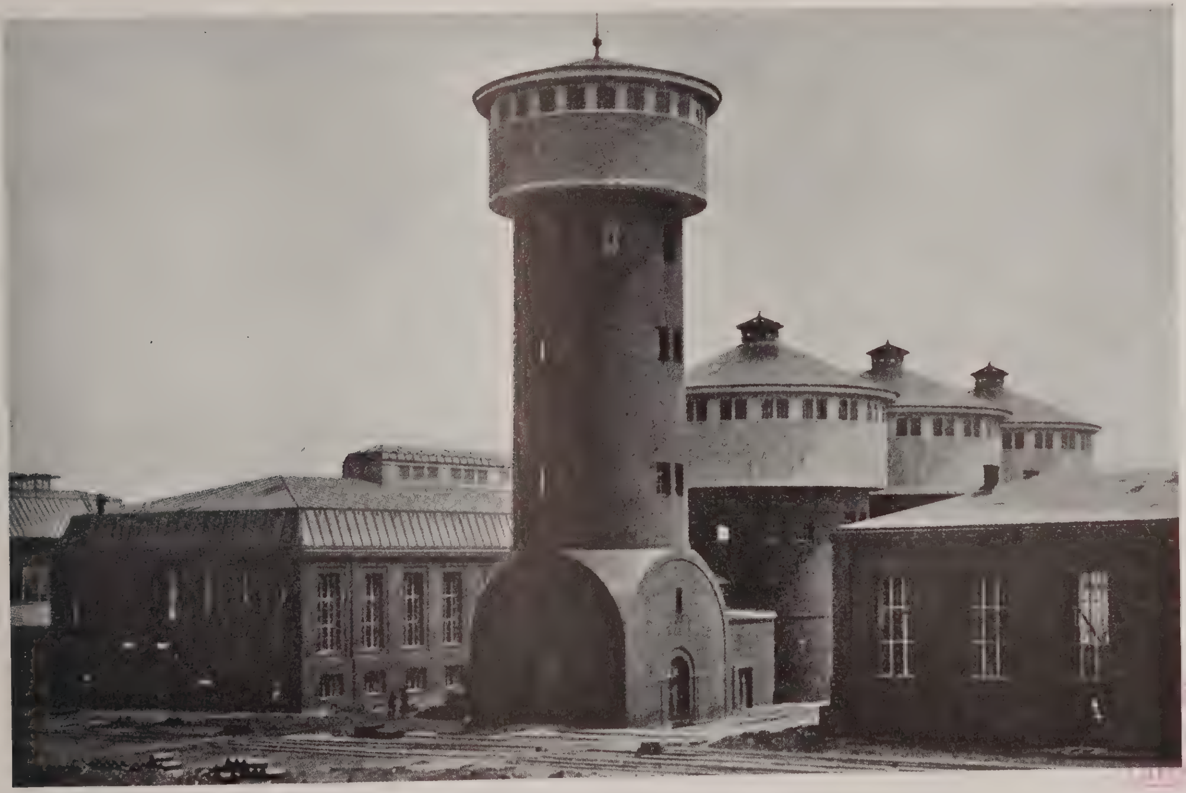
Montagehalle, A. E. G. Company, Berlin
Peter Behrens, Architect



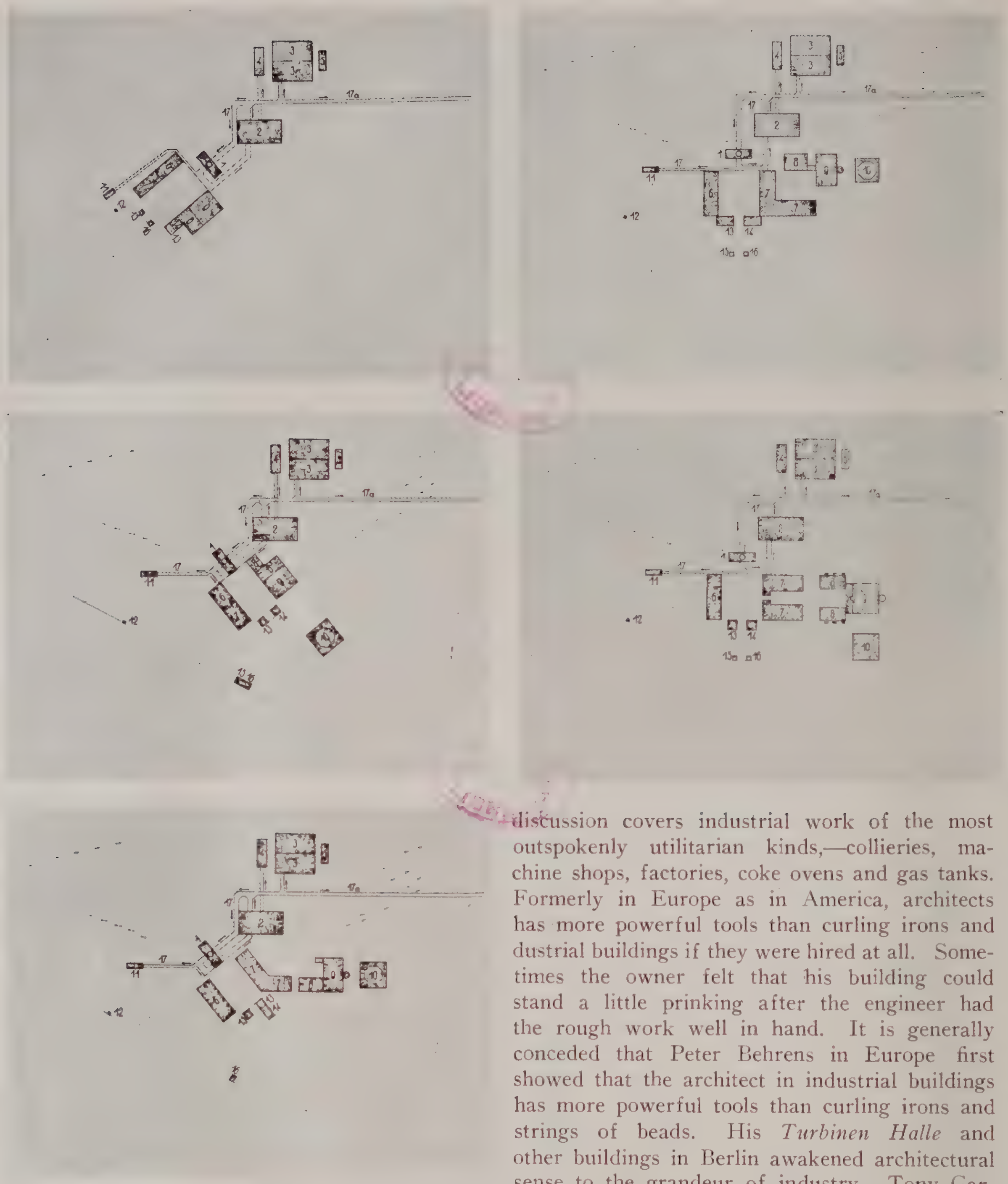
MAIN BUILDING, A. E. G. COMPANY, BERLIN
PETER BEHRENS, ARCHITECT



TURBINEN HALLE, A. E. G. COMPANY, BERLIN
PETER BEHRENS, ARCHITECT



FACTORY AT FRANKFORT
PETER BEHRENS, ARCHITECT

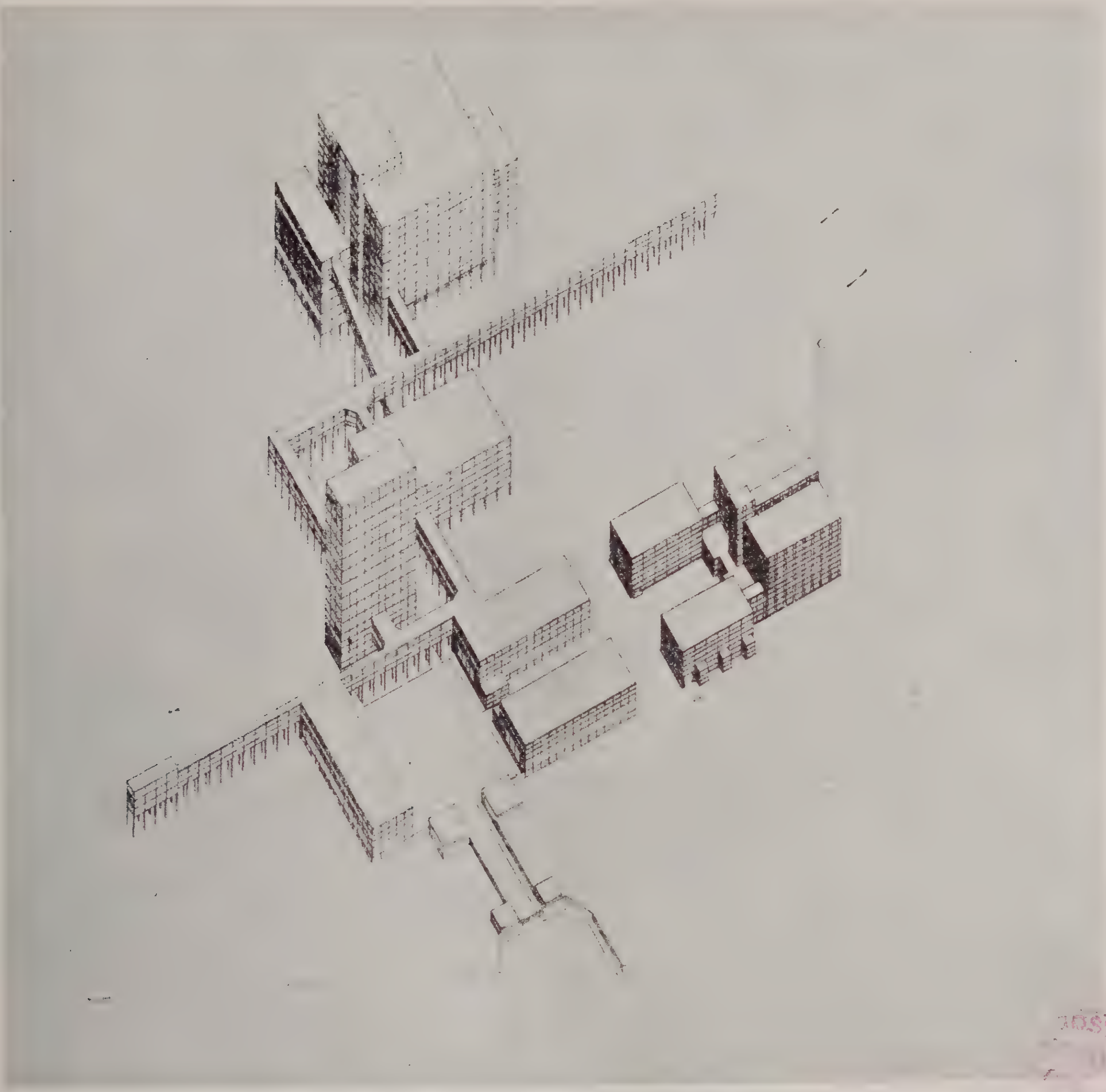


Studies to Secure Symmetrical Grouping of Colliery Buildings

point the architect touches some human need deeper than mere structure, or else he fails in rendering the service expected of an architect.

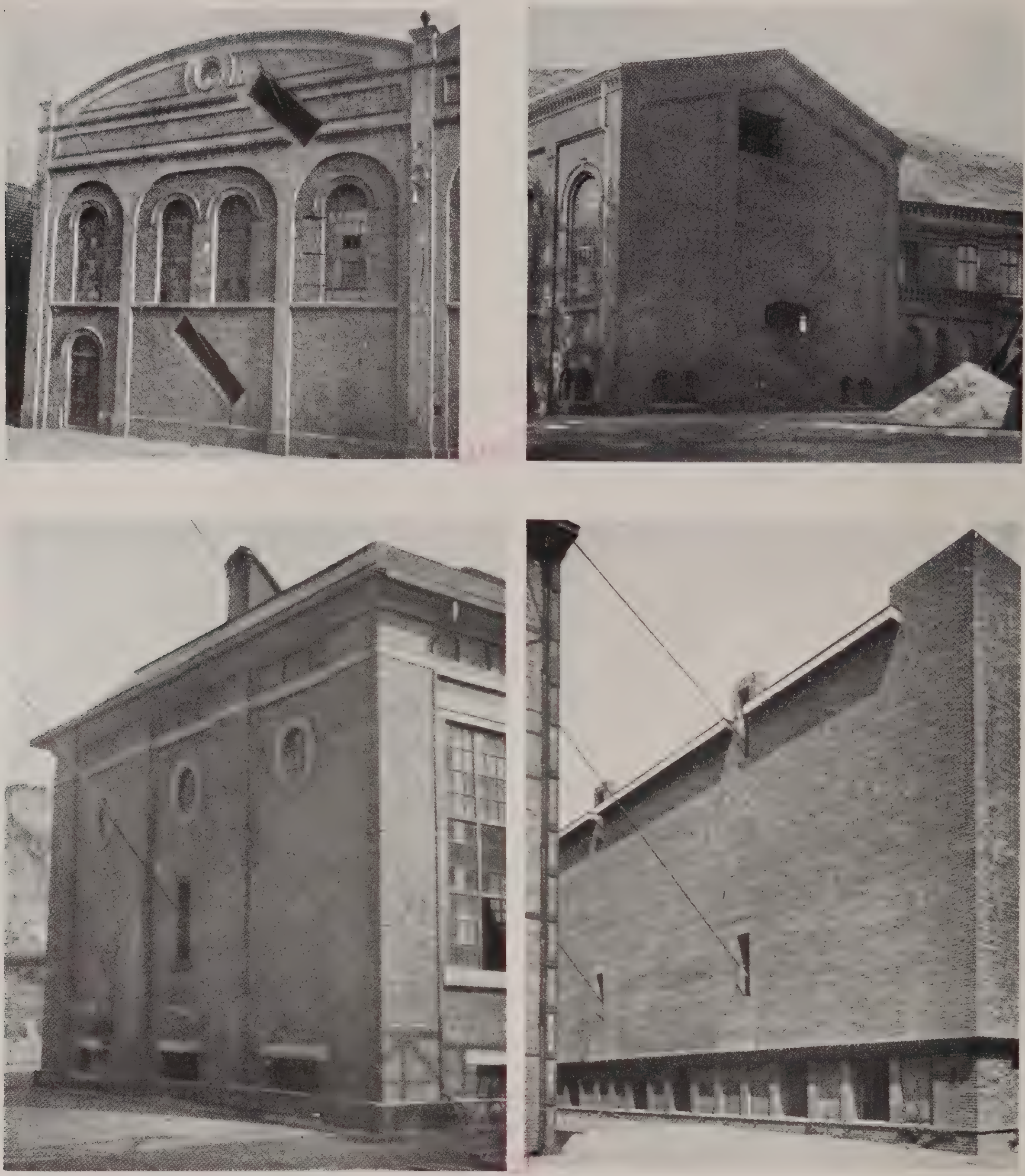
The source of most of the illustrations to this article is a book fresh from Germany with the trenchant title "Architect *versus* Engineer or Architect and Engineer." It is written by two graduated engineers, Mr. Schupp and Mr. Kremmer, who are, besides, architects. The field of discussion covers industrial work of the most outspokenly utilitarian kinds,—collieries, machine shops, factories, coke ovens and gas tanks. Formerly in Europe as in America, architects has more powerful tools than curling irons and dustrial buildings if they were hired at all. Sometimes the owner felt that his building could stand a little prinking after the engineer had the rough work well in hand. It is generally conceded that Peter Behrens in Europe first showed that the architect in industrial buildings has more powerful tools than curling irons and strings of beads. His *Turbinen Halle* and other buildings in Berlin awakened architectural sense to the grandeur of industry. Tony Garnier repeated the same service for France in his *Abattoirs de la Mouche* at Lyons.

The importance of industrial expansion after the war placed a new emphasis on industrial building. Here was something in the overturned social scheme which had at least the reality of a concrete service. The impulse was to dignify this service, and, following the precedent set by Behrens, architects of high standing found increasing interest in industrial work. Such buildings as Behrens's dye works at Hochst am Main



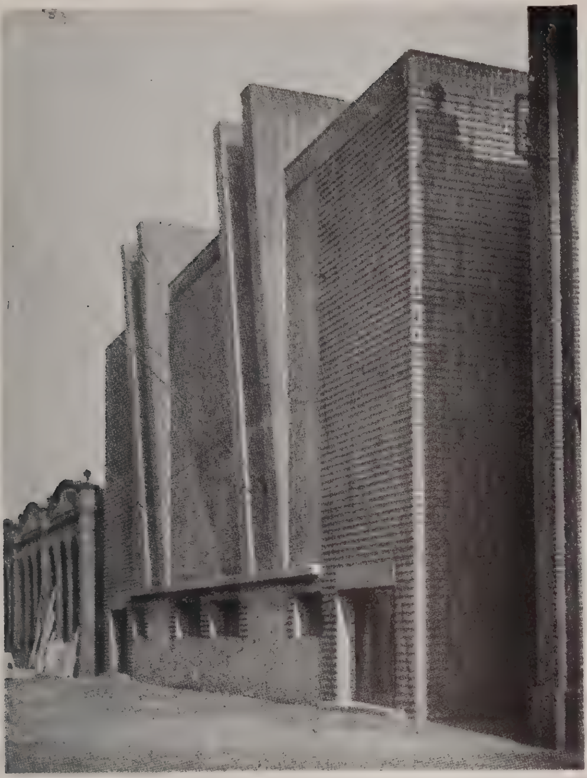
Sketch of Final Grouping of Colliery Buildings. Page 65, "Architect vs. Engineer"

(Illustration Moderne Bavformen, page 331), Alfred Fischer's power plant at Cologne, and Erich Mendelsohn's hat factory near Berlin illustrate the success with which architects entered this field. An entire school of architects, in fact, was carried away by the glories of the completely utilitarian. For some, architecture and the product of the engineer became the same. Any work of engineering possessed final beauty because it was the result of function frankly expressed. Of great and often healthy influence, this idea is gradually becoming modified. Too many buildings have been built by engineers with all the elements in correct sequence, built of appropriate materials, and yet possessing no perceptible coherence. Conduits will plunge through raw looking gaps in walls, steel skeletons brandish tanks through roofs, and the whole tatterdemalion succession of brick, steel, concrete and corrugated iron produces too often the effect of mere brutality. The day of the old architect who built a power station on the proportions of the Petit Trianon and then allowed this structure to be pierced by ventilators, conveyor belts and ærial gangways, is also happily past. The architect is the man trained in the proportioned arrangement of space; it is he who takes the engineer's ruder sequences and arranges them in order. This order is not that of a regiment of soldiers commanded to a scheme but the result of an individualistic study of the elements composing the whole. Certain elements form natural groups, which again lead on to other groupings of kindred functions. The whole is

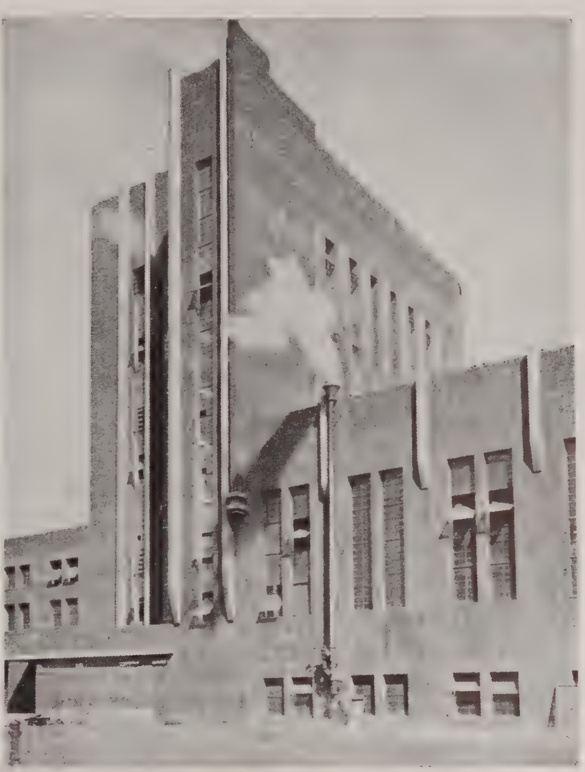


Illustrations, Page 7 of "Architect vs. Engineer," Showing Right and Wrong Treatments of Power Cables

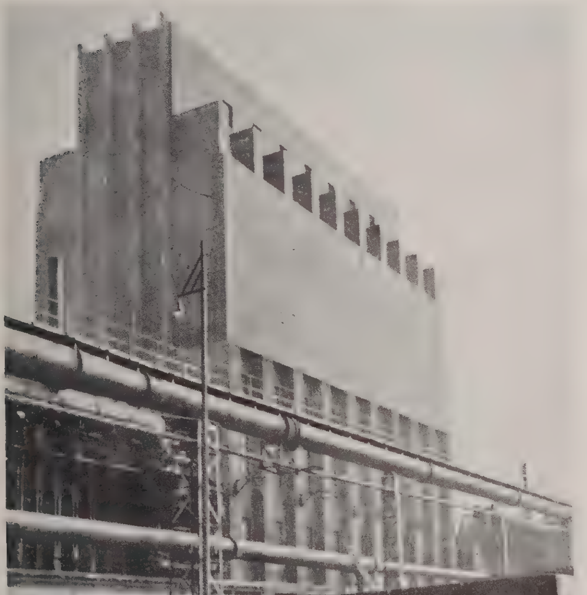
organized with an eye to presenting all of the parts as favorably as possible with as much space about them and between them as can be had, the while a sense of the groups forming one whole is maintained. The development from an engineering solution of a problem to an architectural arrangement is shown in illustrations 1, 2, 3, 4 and 5 on pages 61, 62 and 63 of "Architect *vs.* Engineer." The finished building mass is on page 65. The subject of the layout is a colliery. The road and railroad approach remain constant factors. The chief elements are: shaft house (1), with tower hoists, power and boiler houses (8, 9), (7) work shops, (6) executive, (3) washing, (2) shipping; (17a) leads to old mines. While it is plain that the architect has greatly increased the amount of foundation work, it can also be definitely asserted that the final scheme shows more organic arrangement and gains in clarity, in wholesomeness, and in



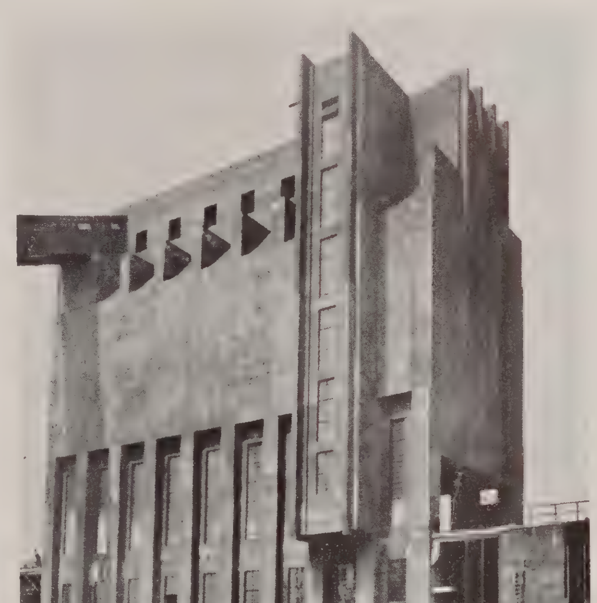
FROM PAGE 9, "ARCHITECT VS. ENGINEER," SHOWING TREATMENT OF A CABLE WALL—ENTRANCES



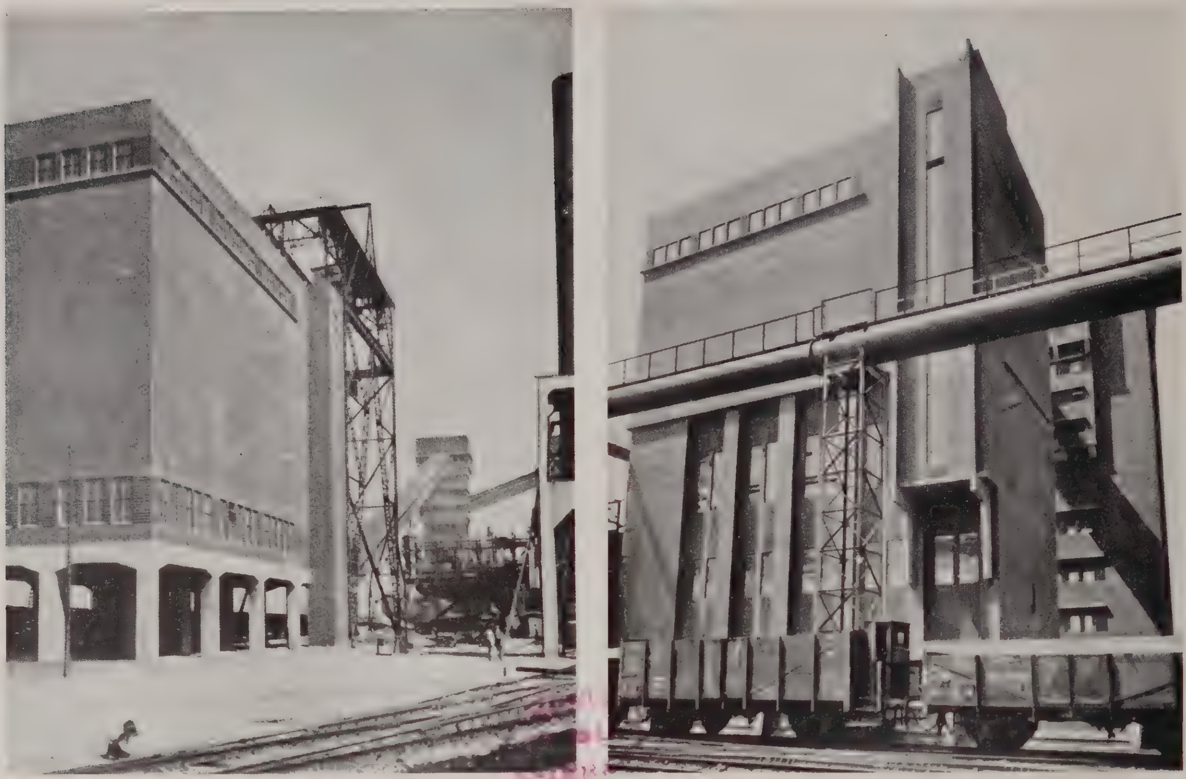
FROM PAGE 11, "ARCHITECT VS. ENGINEER," ILLUSTRATING AN EXAMPLE OF A MODERN ELEVATOR SHAFT



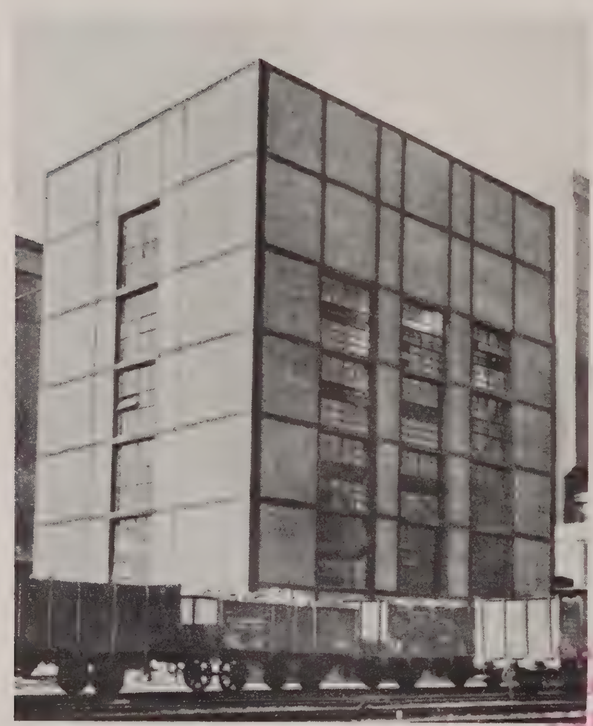
FROM PAGE 17, "ARCHITECT VS. ENGINEER," SHOWING SYMMETRICAL COAL ELEVATOR



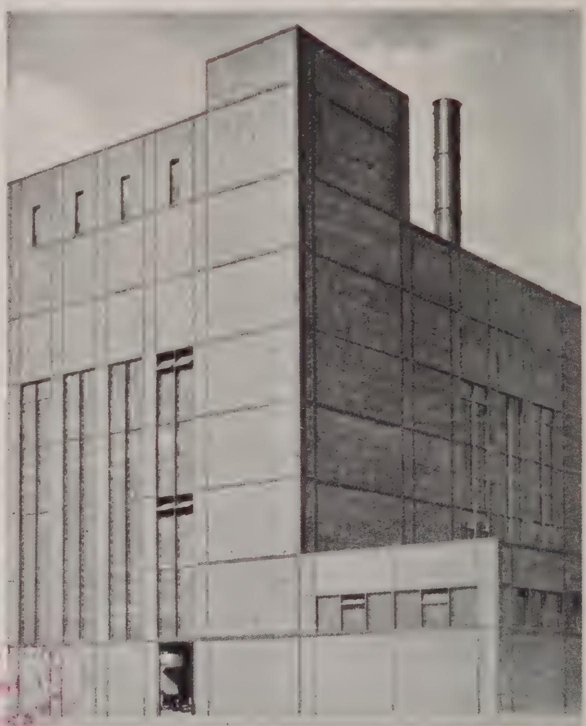
FROM PAGE 14, "ARCHITECT VS. ENGINEER," ILLUSTRATING TREATMENT OF EXTERIOR STAIR SHAFT



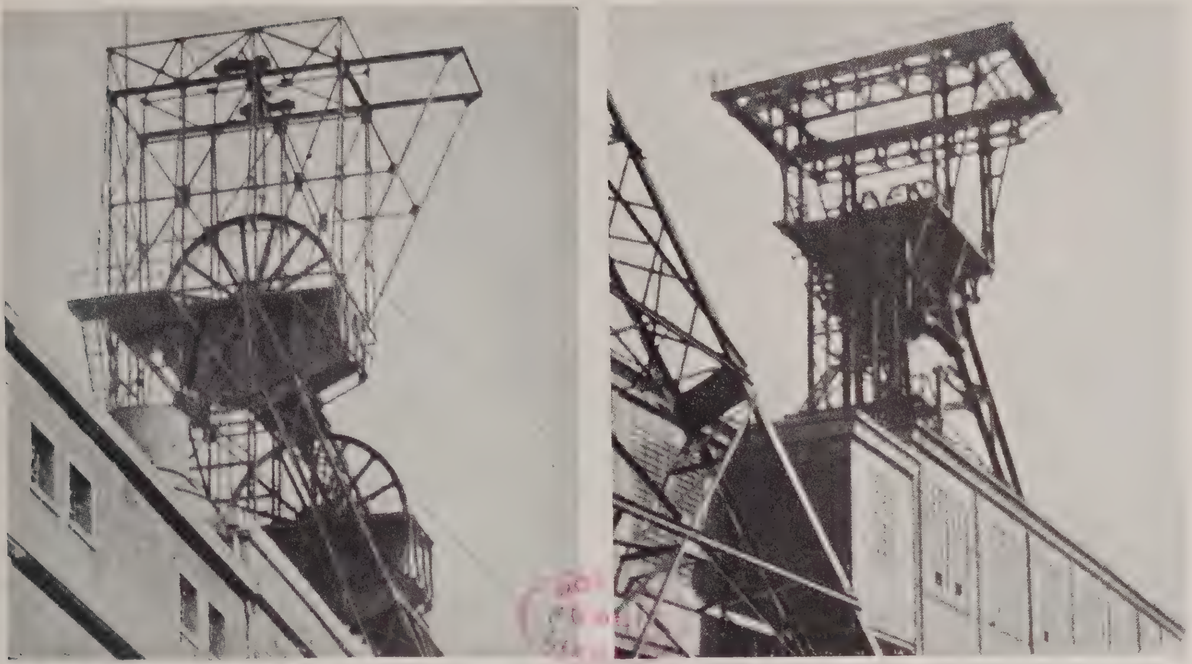
FROM PAGES 12 AND 14, "ARCHITECT VS. ENGINEER," ILLUSTRATING VERTICAL EXPRESSION OF STAIR AND ELEVATOR SHAFTS



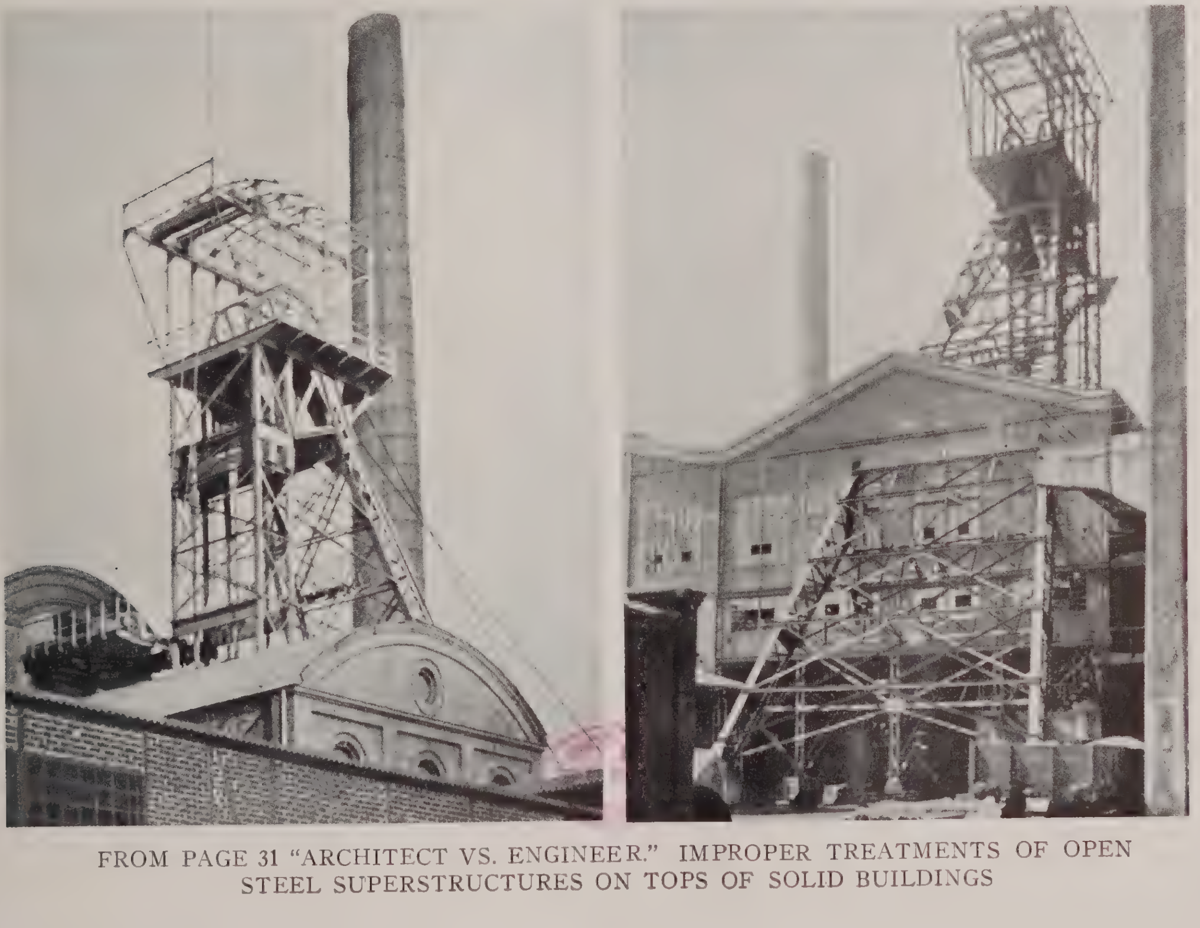
FROM PAGE 25, "ARCHITECT VS. ENGINEER." IRON WORKS SHOWING STEEL CONSTRUCTION THROUGH BRICK WALLS



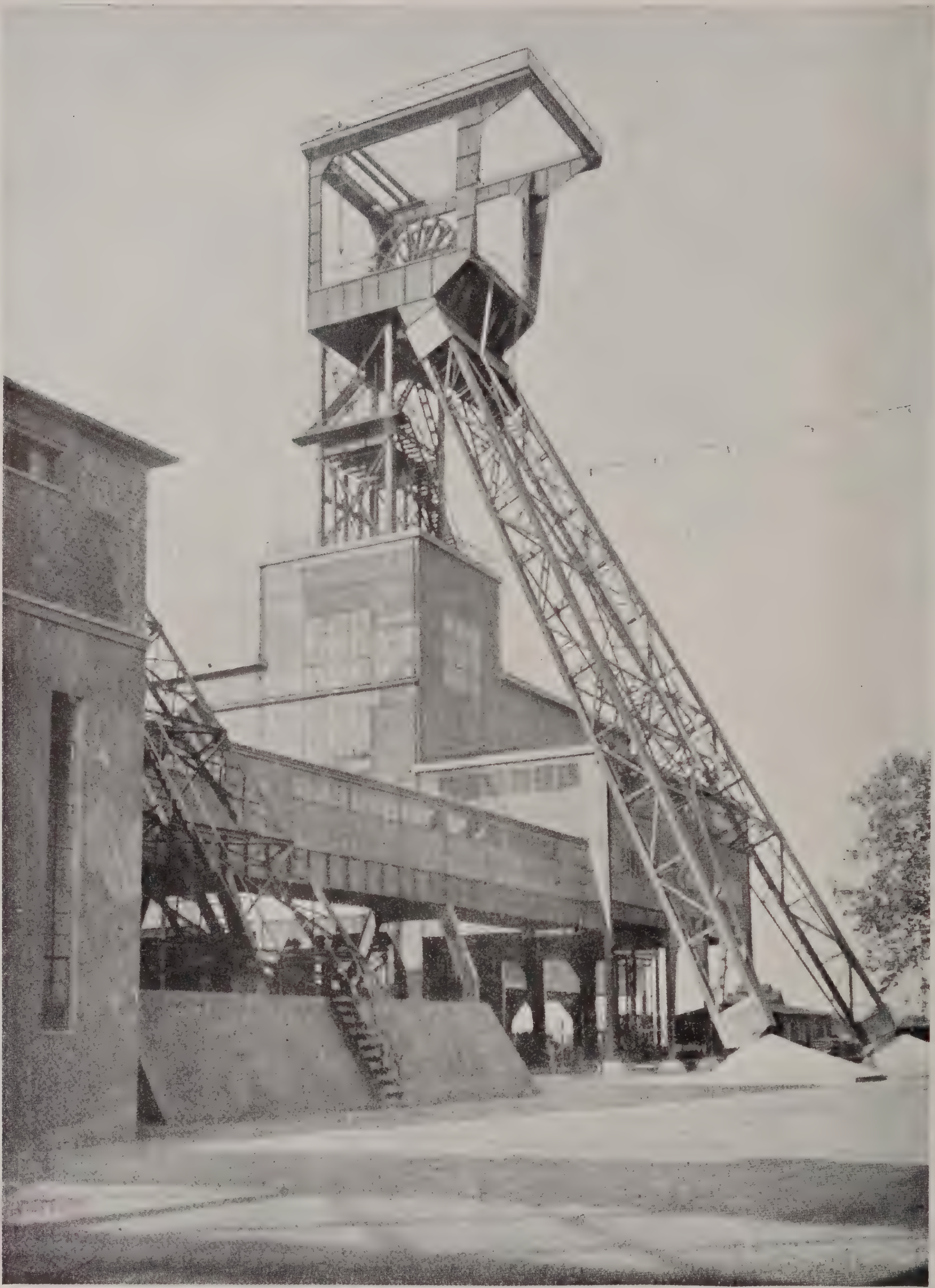
FROM PAGE 26, "ARCHITECT VS. ENGINEER." BOILER HOUSE SHOWING STEEL CONSTRUCTION THROUGH BRICK WALLS



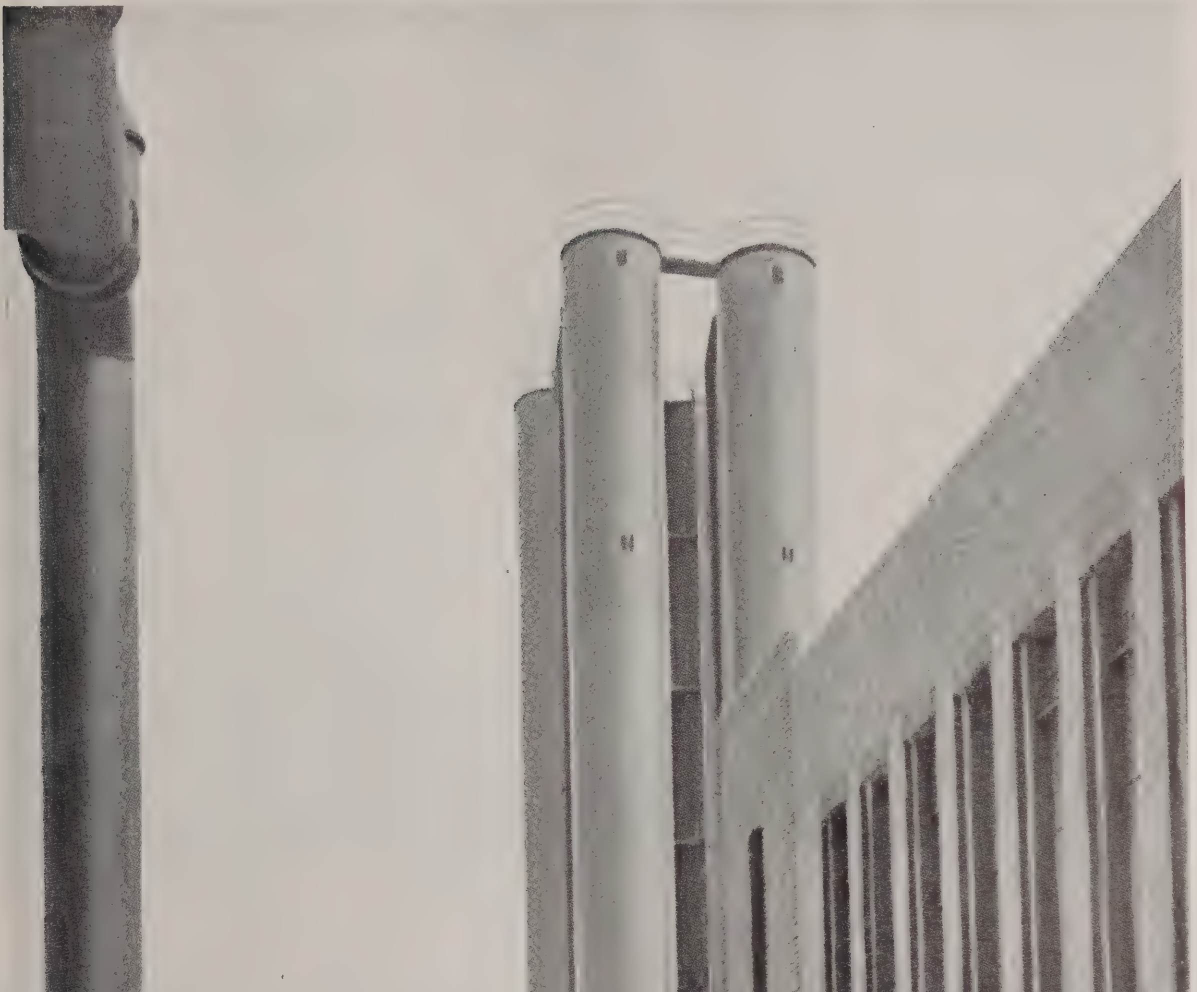
FROM PAGE 29, "ARCHITECT VS. ENGINEER." HARMONIOUS TREATMENT OF STEEL SUPERSTRUCTURES ON TOPS OF SOLID BUILDINGS



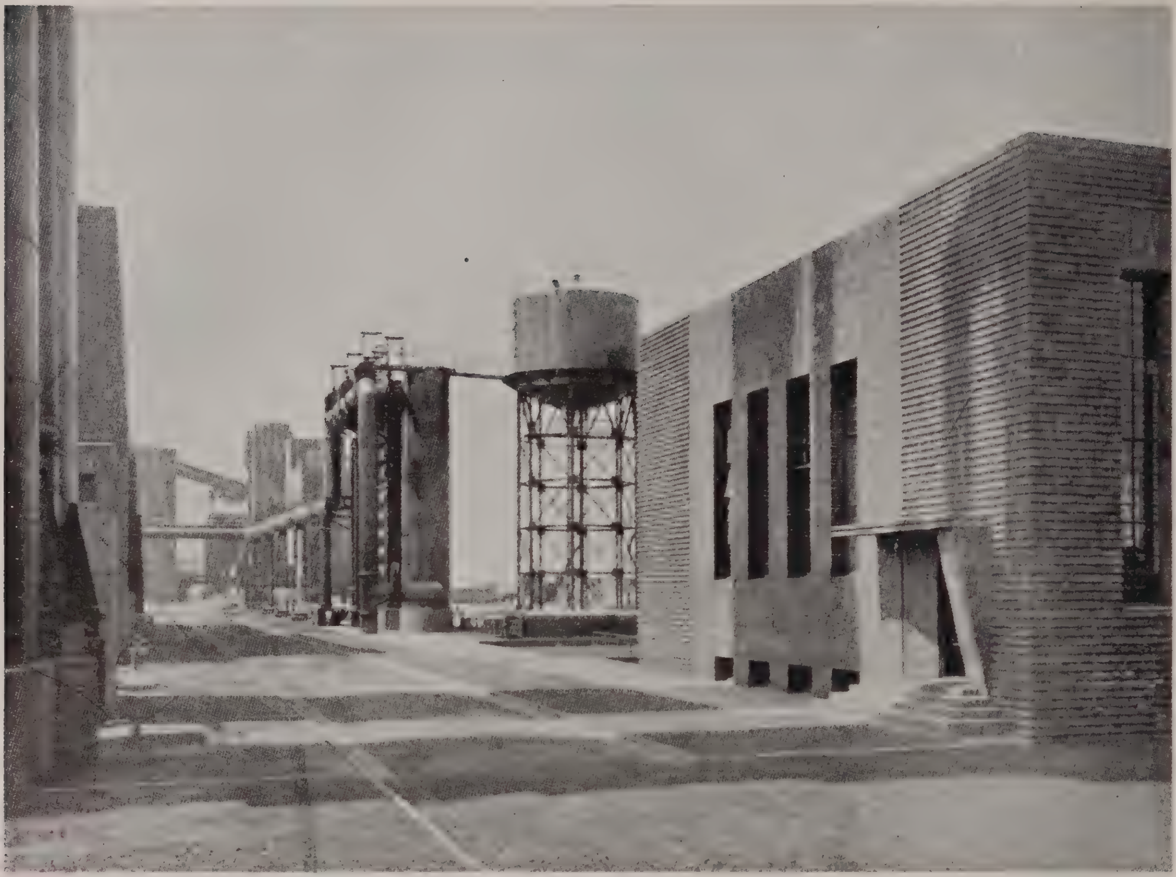
FROM PAGE 31 "ARCHITECT VS. ENGINEER." IMPROPER TREATMENTS OF OPEN STEEL SUPERSTRUCTURES ON TOPS OF SOLID BUILDINGS



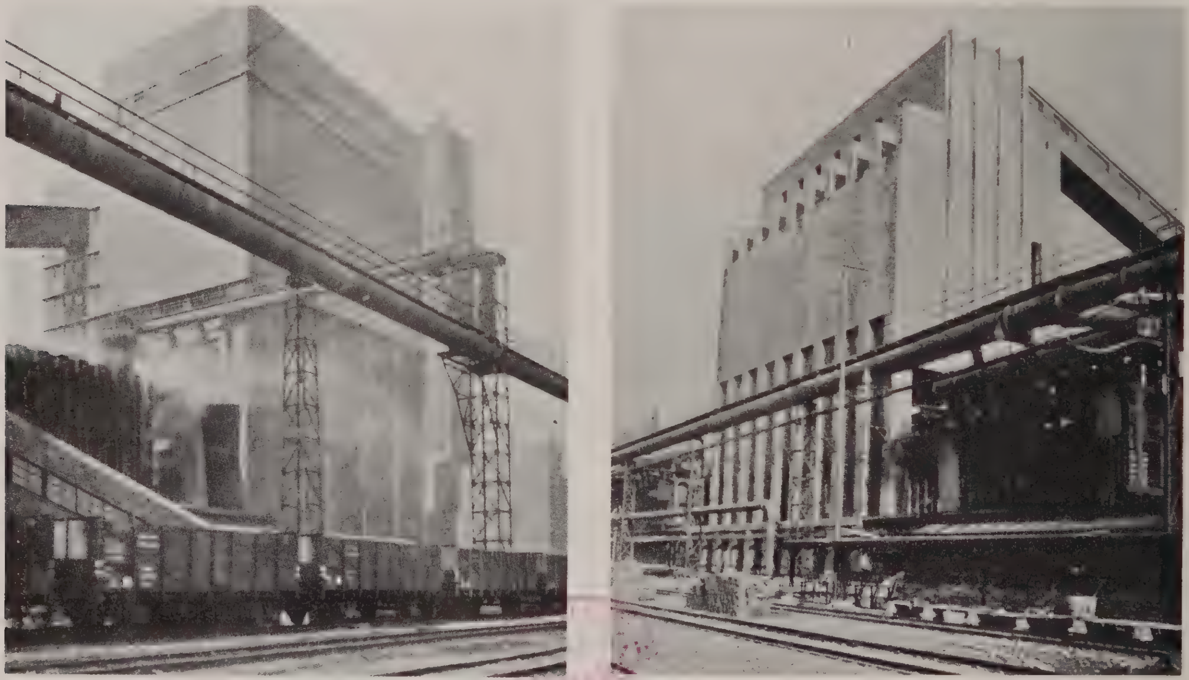
FROM PAGE 33, "ARCHITECT VS. ENGINEER." PROPER INCORPORATION OF OPEN STEEL SUPERSTRUCTURES IN THE BUILDING SCHEME THROUGH TOWER BASES



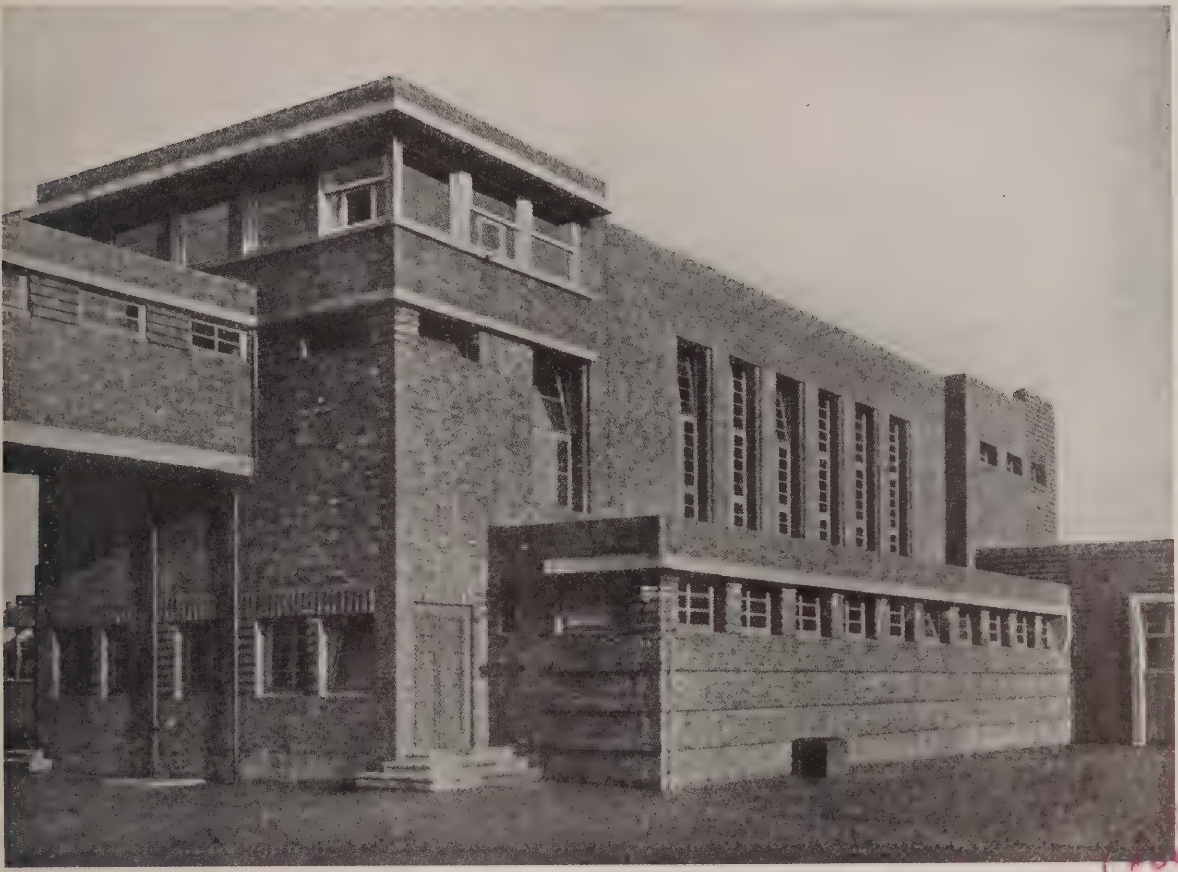
FROM PAGE 39, "ARCHITECT VS. ENGINEER," SHOWING ORDERLY ARRANGEMENT OF STANDPIPES AND BUILDINGS



FROM PAGE 36, "ARCHITECT VS. ENGINEER," SHOWING ORDERLY ARRANGEMENT OF TANKS, SMOKE STACKS, STANDPIPES AND BUILDINGS



FROM PAGE 42, "ARCHITECT VS. ENGINEER," SHOWING AERIAL CONDUITS UTILIZED TO BIND BUILDING GROUPS TOGETHER



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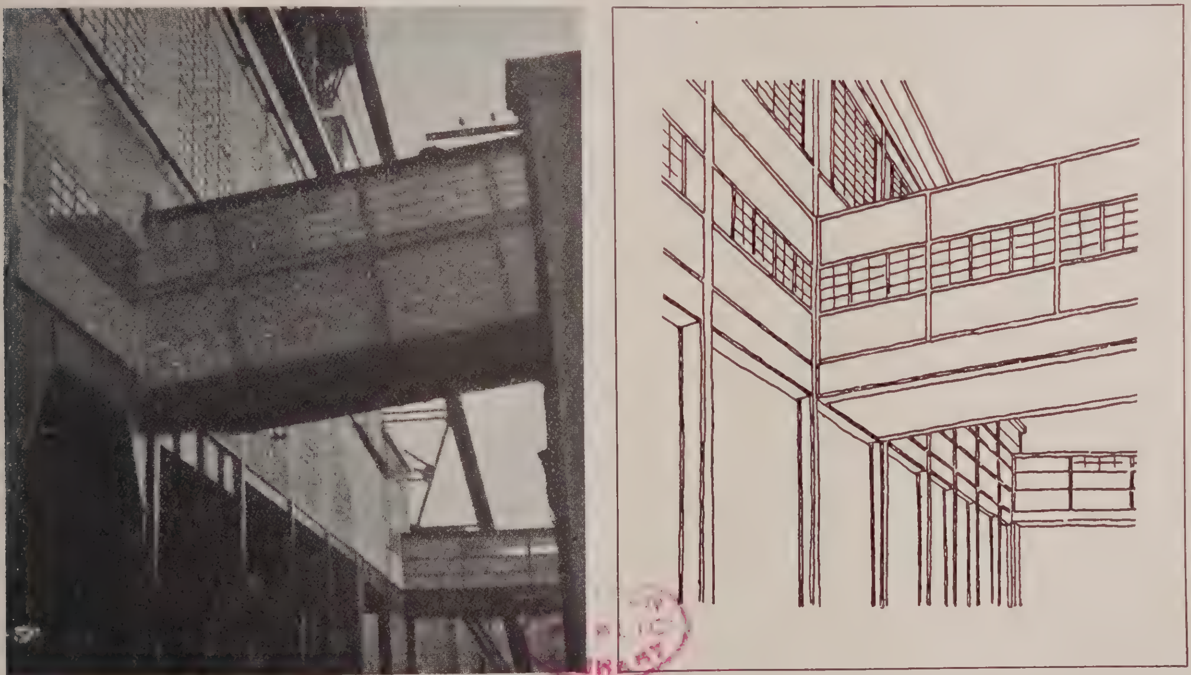
FROM PAGE 45, "ARCHITECT VS. ENGINEER," SHOWING CORRECT WAY OF TYING AN AERIAL GANGWAY INTO A BUILDING



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FROM PAGE 44, "ARCHITECT VS. ENGINEER," SHOWING INCORRECT AND CORRECT WAYS OF BUTTING AERIAL GANGWAYS INTO BUILDINGS spatial composition. The writer has previously inveighed against the extreme school of modernists who would avoid the "court of honor" scheme because of the literary associations of the word when such a scheme serves the purposes of a clear arrangement for units and useful connection between them. He is of the opinion that monumentality is an admissible expression of industrialism and that there are no monuments more appropriate to this age than its industrial buildings,—provided that the monumentality is real and not of the improved "Trianon" variety.

This search for reality of expression forms the subject matter of most of the illustrations and attains its end for the most part successfully. Page 7 of "Architect *vs.* Engineer" illustrates the raw and gradually improved treatment of a cable power belt. Page 9 its fully expressed function. Pages 10, 11 and 12 illustrate the clear, vertical expression of stair and elevator shafts.

Pages 18 to 28 illustrate the use of brick. In buildings where resistance against coal-gas laden atmosphere, smoke and general industrial impurity of the air is imperative, brick is the ideal material. Its quiet, warm, unified color binds buildings of diversified purposes into harmony. The ease with which the variation of a pattern can be introduced through modulation of surface and color to break monotony is one of its greatest assets. Its chief disadvantage is that it presents too fixed an appearance,—too solid a monumentality. In buildings filled with machinery a certain freedom for the walls to vibrate is necessary. The changing needs of modern industry make easy extension or alteration of the building one of its desirable properties. These considerations are not met by brick used by itself, but when used to fill between exposed steel framework it immediately meets the practical needs and gives a visual impression of the fulfillment. Since the modern building is really only a screen to regulate light and to protect against weather and temperature, this membrane-like structure, resembling half-timbering, gives a perfect expression of both structural facility and functional reality. When, as in the engine houses on page 23 and the iron works on page 25 and the boiler house page 26, windows and steel framework are in one visibly related scheme, a close unity or harmony in expression of the building elements is attained.

The next feature of industrial work to be discussed is the open steel superstructure on top of the solid building. Page 29 of "Architect *vs.* Engineer" shows the development of such features toward harmony with the solid structure beneath through the use of solid plate girders. Page 31 illustrates the accidental, uncoördinated location of such superstructures and 33 their proper incorporation in the building scheme through tower bases.

Page 36 of the same work illustrates an orderly arrangement of diverse elements such as standpipes, water tanks and solid buildings. Because of well proportioned planning and wise placing, these various types of construction count each for its own function without noisiness. It is sometimes possible and desirable to enclose such varied and inharmonious features, but it is not always necessary æsthetically nor always practicable to so screen them.

Pages 42 and 43 of "Architect *vs.* Engineer" show ærial conduits utilized to bind the building groups together instead of crawling over and among them. On 44 and 45 the correct and incorrect ways of butting ærial gangways into buildings are shown. Preserving the window banding ties the elements together. Where possible, the maintenance of a single scale pane and window openings proportioned to the unit do much to maintain unity in the arrangement. When this unit can find repetition in doors and brick courses, a still more unified effect is assured.

Messrs. Schupp and Kremmer give advice in "Architect *vs.* Engineer" to the architect. Accepting the architect as one sensible to beauty and amenable to advice from the engineer, his value is established. Only when the age decides against pride in the monuments to its industry will the architect prove unnecessary. Only when the architect is not content with a real solution of his problem, but prefers to make a stage setting, will the engineer do better without him. The age has elements of greatness too vast to become the property of one profession, and solving collective problems requires collective thinking. Industry gives us something entirely our own to express without relation to what other ages have hitherto expressed, and herein lies inspiration.

EDITOR'S NOTE. *To Mr. Arthur T. North we are deeply indebted for permission to reproduce a number of the illustrations from the book on German industrial buildings by Messrs. Schupp & Kremmer, published in Berlin this year, entitled "Architekt und Ingenieur." This book was sent to Mr. North by his friend, Dr. Edmund Schueler, who, due to a serious illness this summer, was unable to prepare for us a review of this important work on the architecture of factory buildings, which was finally written by Shepard Vogelgesang of the office of Joseph Urban. This subject of carefully studied architecture in the design and arrangement of factory buildings is only in its infancy in this country. It is recommended that all architects and engineers interested in architectural improvement in the design of factory buildings should study carefully the work of the several foreign architects, as well as the foreign books suggested by Mr. Vogelgesang in his brief but interesting article.*

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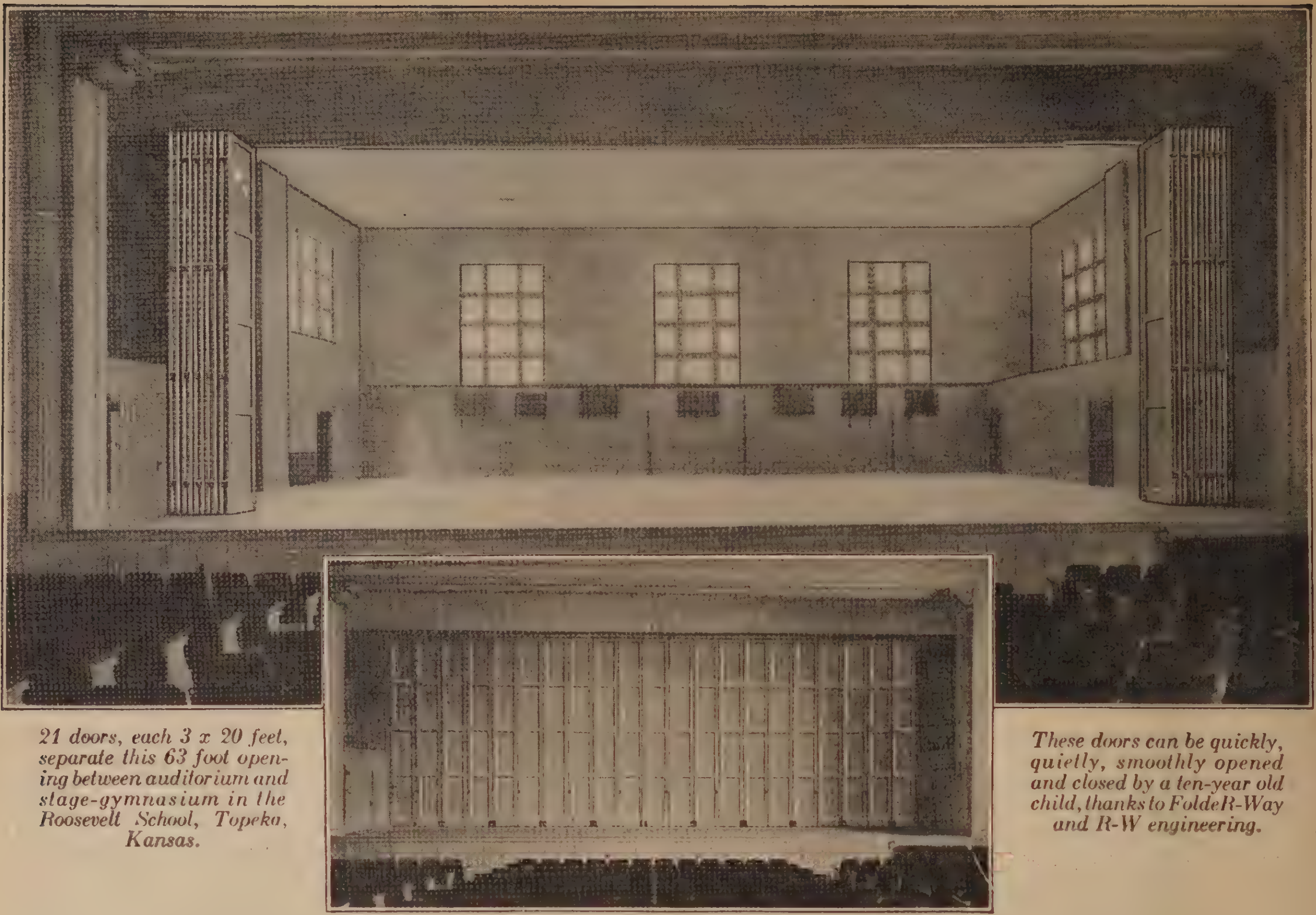

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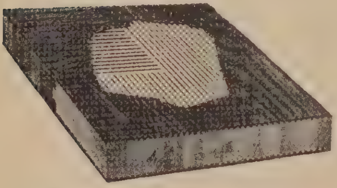

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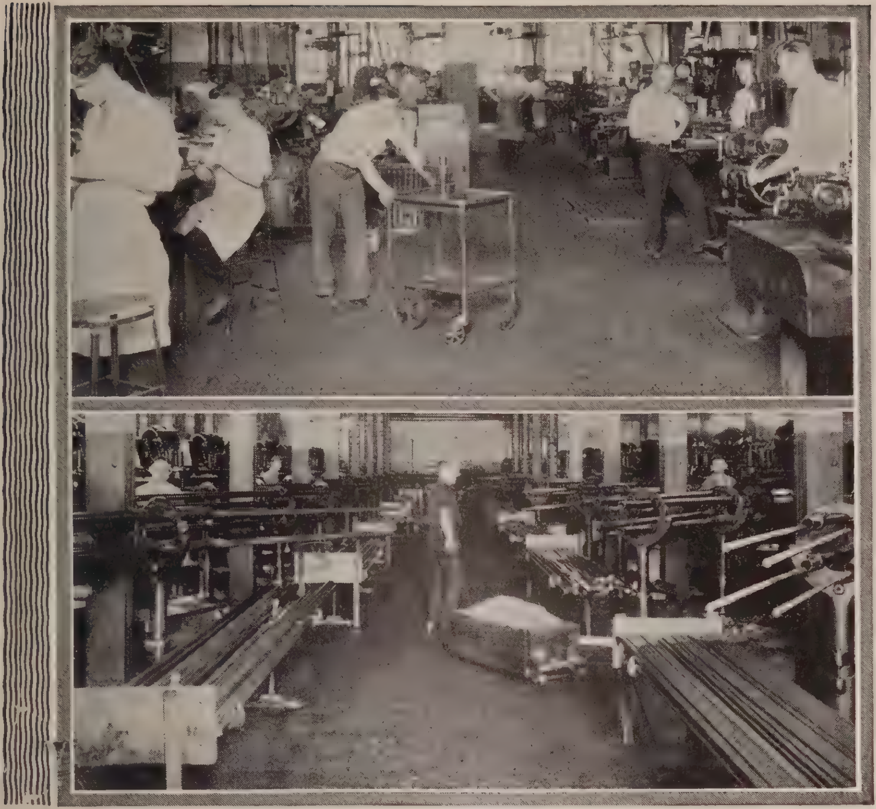

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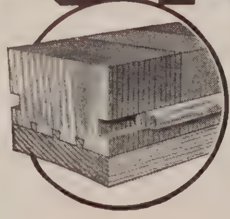
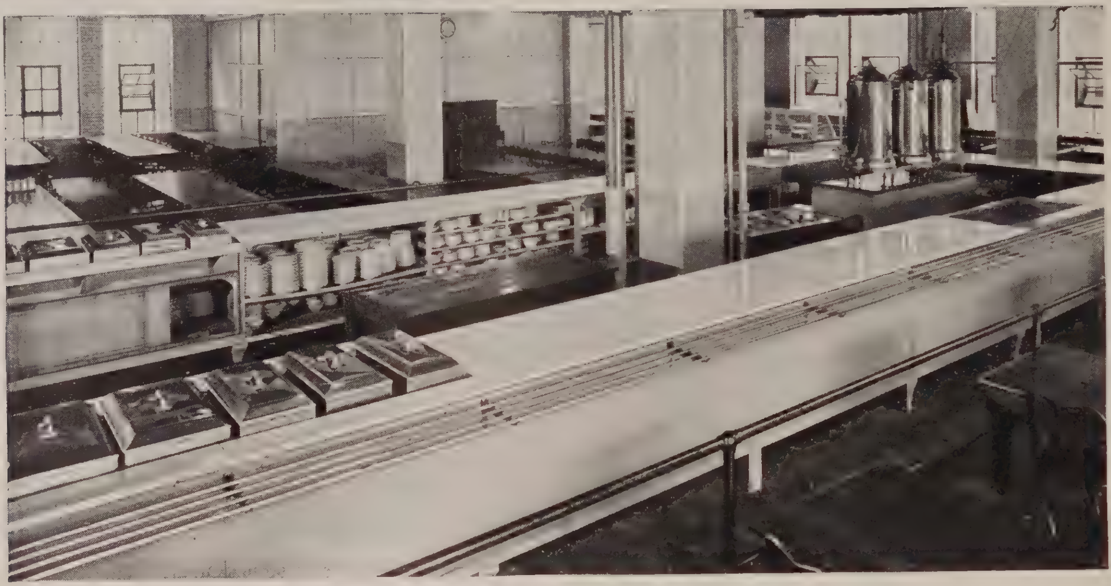
FLOORING

Bloxonend is made of Southern Pine with the tough end grain up. It comes in 8 ft. lengths with the blocks dovetailed endwise onto baseboards



Lays Smooth
Stays Smooth

PLAN WITH INDUSTRIAL



Van Cafeteria in the plant of Procter & Gamble, Port Ivory, New York

Left, Van Cafeteria, Western Union, St. Louis, Mo.

Above, Van Kitchen, Dodge Brothers Plant, Plymouth, Mich.

Below, an unusual cafeteria created by Van for the Berkshire Knitting Mills, Reading, Pa.

BOOK DEPARTMENT

THE DESIGNING AND PLANNING OF AIRPORTS

A REVIEW BY
CLIFFORD WAYNE SPENCER

TO be forward-looking is one of the most important characteristics of the successful architect as well as of those engaged in other professions. Architecture should be not only abreast of the times but several steps in advance, so that as soon as an important new industry develops, architects will be ready and competent to provide for the proper housing of that industry in buildings appropriate in design and convenient in layout. It is very evident that the next few years are to see a phenomenal development in the air transport industry all over the world. It is still an infant industry, and the ground has scarcely been broken. Indeed, it does not require a very vivid imagination to visualize in the near future the day when the bulk of all passenger travel will be through the air and when much of the freight will be transported by the same means. It will be a great advantage for people to live in pleasant temperate regions and be supplied with food brought fresh from luxuriant tropical sections in gigantic planes within the period of a very few hours. Such gigantic transportation systems as are certain to develop will require a great number of specialized structures and terminal facilities. As the architects of a few decades past have been concerned with the building of great rail and shipping terminals, so the architect of the future will be called upon to design great airports which will combine many features of railroad terminals with facilities necessary for travel by air. This time is not far distant.

The airports so far developed in America are surprisingly disappointing as to both appearance and convenience, consisting too often of a few dilapidated looking shacks grouped about a dusty, uneven field in the midst of a desolate waste of dumps and ash heaps. Such surroundings have a very definite effect on the popularity of travel by air, since the dispiriting impressions gained at the start and finish of an air trip will do much to counteract the genuine pleasure to be experienced from a trip by air. Certainly a person who has to undergo a combined sand and cinder blast or to tramp through mud and water and ride in cold weather with water-soaked feet will not be in a hurry to repeat the experience. Of course such conditions do not exist at all fields. Some of the newer fields, especially in Europe, are very pleasing and convenient, and the arrival and departure of planes take place with all the smoothness, quiet and order of a modern rail terminal. In many places the planes are warmed up at a considerable distance from the platform and brought quietly into position, and the passengers pass from the waiting rooms to the planes through covered passageways, after which the planes move smoothly away at a signal from a central control. As has been said, the air passenger service in Europe is much in advance of that in the United States, due in a large measure to encouragement from several European governments in the form of subsidies and other aid. This lead of European over American facilities is being cut down through the efforts of private citizens and increased interest on the part of the public.

Some of the newer fields in this country have followed foreign precedent and are models of efficiency and good design. There can be no doubt that such fields will increase rapidly in number, and many forward-looking architects are preparing to take advantage of the opportunities which are sure to arise in this field. In order to supply information to those who design and operate airports as well as to stimulate airmindedness in the general public, Lieutenant-Colonel Stedman S. Hanks, of the U. S. Air Corps Reserve, has made an extended tour of the important airports of Europe and has studied their advantages and shortcomings with relation to the construction of airports in the United States. The results of these investigations and of Colonel Hanks' extensive knowledge of the subject are published in a book entitled "International Airports." The design, construction and operation of the important airports of Europe are carefully studied and compared with some of the best in this country, and there is given considerable information on airport operation in foreign countries which has never before been available in printed form. Many of the most noted authorities and men high in European and domestic air circles have coöperated by supplying information resulting from their vast and varied experience. Among them are Major G. E. Woods-Humphrey, General Manager of the Imperial Airways; Colonel the Master of Sempill, President of the Royal Aëronautical Society; General Sir W. Sefton Brancker of the Air Ministry; A. Plesman, Director of the Royal Dutch Air Lines; M. H. Kahn of the Society for the Promotion of Aëronautics in France; Director Otto Merkel, Dr. Dierbach, and Captain Otto Bertram of Deutsche Luft Hansa; and many other heads of air groups and directors of airports.

The international nature of air travel in Europe introduces many considerations into the study of European airports which as yet have not had much influence in America. However, with lines being established to Canada, Mexico, the West Indies and Central and South America, these factors should be taken into consideration in planning American airports. An important advantage of providing an airport with pleasing, permanent looking architecture is that it conveys to the public mind the fact that air travel is an established thing and is here to stay, a feeling which is not fostered by the American factory shed type of building. As

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Small Manor Houses
AND
Farmsteads *in* France

By Harold D. Eberlein and Roger W. Ramsdell

Chateau de Missery, Cote d'Or

IN all the wide search for architectural types in which to design and plan the American home, there has been found nothing more beautiful and appropriate than what is called "French Provincial," the term applying to the better order of farm houses, *manoirs,* and even to minor chateaux. It is a type full of graceful informality along with the touch of dignity or sophistication which renders it just a trifle formal; it is expressive of eighteenth century charm, and it suits admirably the needs of the present-day builders of suburban or country homes. In the refined and slightly reticent exteriors of the old French country houses, much emphasis is placed upon excellent architectural lines, while their interiors show carefully arranged and spacious rooms with well placed chimneypieces, doors and windows.

This excellent and authoritative work should be in the library of every architect whose practice includes work of any kind of residence character. It brings to the attention of American architects a type which is fresh and new without being freakish. It includes 254 illustrations from original photographs showing subjects complete as well as in great detail, together with many measured drawings and perspective plot plans. Flat Quarto (7½ x 11 ins.), bound in handsome library blue buckram, stamped in gold, uncut edges with gilt tops.

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planes of great size are expected to be developed in the near future, the hangars should be made much higher and wider than at present seems necessary, and in the layout of a new field ample provision should be made for a great increase in the volume of air traffic. The mechanical and scientific equipment of the fields should include such apparatus as will supply weather information to the fliers, and a new development in Europe which will doubtless become universal is direct radio communication between the fields and planes in flight. By the use of this service it is possible for a pilot to learn his position by means of triangulation with two stations, even though he be lost in a fog. The safety advantage of this will be quite evident.

The direct results of Col. Hanks' study of European airports is given in the form of detailed descriptions of famous European fields such as Tempelhof at Berlin; Le Bourget, near Paris; Croydon at London; Schiphol at Amsterdam; Waalhaven at Rotterdam; Statens Lufthavn at Copenhagen; and Littorio at Rome. Representative American airports are those at Buffalo and the municipal airports at Chicago and at Oakland, Cal. Other ports are shown in plan and illustration and give a very clear impression of what the modern airport should be like. Conditions of European air travel are made clear in the chapter "Impressions of an Air Voyager in Europe."

The airports of Europe closely resemble railway stations, being busy all day long with planes arriving and departing on schedule. The average European airport covers about three quarters of a square mile and has hangar space ample for the largest planes with fuel storage for about 30,000 gallons of gasolene and oil. There is usually an attractive restaurant, and there is a staff to supply reports as to wind direction and weather conditions along an entire route. The handling of passengers and freight at an airport is assuming greater importance daily and requires a considerable staff of operators as well as much forethought in planning. The workings of an air transport system are rather complicated and should be carefully studied by those interested in airport design. It is probable that the bulk of air transport in the United States will soon be concentrated under the control of one or a very few large companies as is the case in Europe where the Deutsche Luft Hansa, Imperial Airways, and Royal Dutch Air Lines carry the bulk of the passengers and freight. In the case of the Deutsche Luft Hansa the airports are constructed by the cities under the guidance of an expert furnished by the Luft Hansa, thus insuring a large number of well planned fields throughout the country.

The desirable features to be included in a well planned airport as described by Col. Hanks include a few briefly summarized points. The airport should be at the junction of several feeder air routes and on a main trunk line with good transportation facilities and close to the business section of the city. If possible the city itself should be located to the leeward of the field so that prevailing winds will not blow smoke over the field. Present practice is to have fields of circular form with eight runways orientated with respect to prevailing winds and not less than 3,500 feet in length. A carefully designed drainage system should be worked out so that the field will not be wet and muddy. Runways where necessary should be smooth and free from dust and should be reached by a paved roadway to allow planes to "taxi" smoothly into position for starting. The buildings should be located well away from the field to allow an adequate safety zone and a clear approach. They should be laid out so that traffic may circulate freely without collisions or causing congestion. The structures should be built in accordance with the best practice of modern fireproof construction, and the design be carefully studied for architectural character. The planning of lighting is a most important phase of airport design and is fully treated by Col. Hanks in a chapter on "The Lighting of Airports," as is also the subject of "Communication, Radio, Telephone and Telegraph." A summary of "Typical American Airport Rules and Regulations and Regulations of the United States Air Commerce" gives much useful information as to the actual manner in which planes should leave and enter an airport, all of which should be thoroughly understood by anyone undertaking design in connection with airport construction. A great deal of similar information is contained in the appendices dealing with the International Air Navigation Convention, the Pan American Convention on Commercial Aviation, Typical International Air Commerce Regulations, and the Berlin Airport Company's contract with the city of Berlin.

The complexity of factors entering into the design of airports calls for a highly specialized study of the subject and naturally involves a great deal of coöperation between the architectural and engineering professions in order that the fields may present a pleasing appearance and be scientifically and practically correct. Already men in architectural offices in New York and throughout the country are busy with the design of airports, and as the air transportation industry expands there are certain to be greatly enlarged opportunities in this field. It is hard, at this early stage, to determine just what the nature of the airport of the future will be, but the present tendency seems to be toward combining other features with the actual necessities for flying in order to increase public interest as well as to provide pleasant pastimes for passengers and those awaiting arrival of planes, as at the Littoria Airport in Italy, which is composed of a two-story hangar building, a three-story airplane factory with a three-story observation tower above, a hotel, club house, tea garden, athletic field, and a concrete grand stand. The effect of all this has been to greatly increase the interest of the Roman populace, and other cities may well profit by the example. It is to be hoped that the architectural profession will seize this opportunity.

INTERNATIONAL AIRPORTS. By Stedman S. Hanks. Lt.-Col. Air Corps Reserve. 195 pp., 5¾ x 8½ ins. Price $5. Ronald Press Company, 15 East 26th Street, New York.

RUSSIA, EUROPE AND AMERICA: AN ARCHITECTURAL CROSS SECTION. By Erich Mendelsohn. 224 pp., 9 x 13 ins. Price $6. Architectural Book Publishing Co., Inc., 108 West 46th Street, New York.

IN "Russia, Europe and America," Erich Mendelsohn pictures Europe in a sort of spiritual-economic sandwich. In type, in illustrated material, Europe's part in the work and in the world scheme becomes small. Russia's depth of feeling, intuition, and religious urge, and America's rationalism and unproblematic power of realization are seen as the dominant world forces of the day, —America individualistic and earthy, Russia collective and God-aspiring. This standpoint Mendelsohn presents

"The Domestic Architecture of England During the Tudor Period"

By THOMAS GARNER *and* ARTHUR STRATTON

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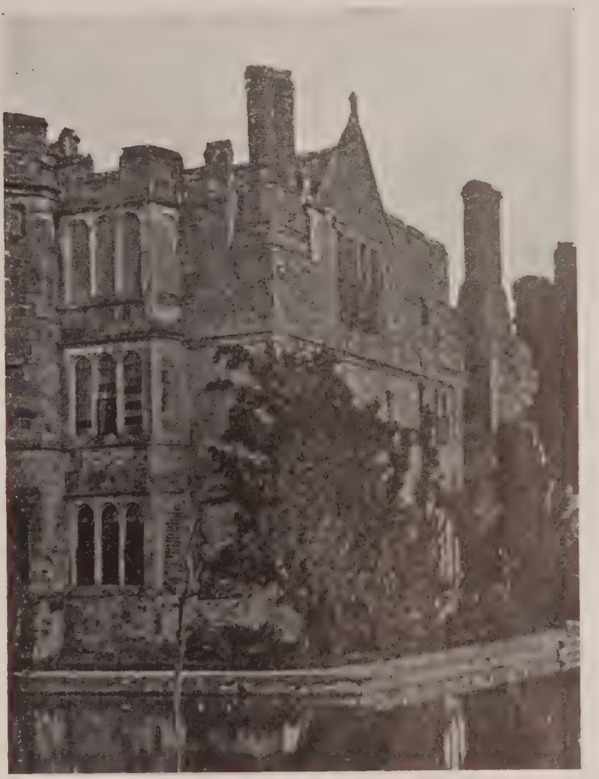

HEVER CASTLE, KENT.

¶ "Garner and Stratton" invariably comes into use when an architect is working in the Tudor, Elizabethan or Jacobean style. Its brilliant illustrations of old buildings may be depended upon to afford precedent for modern work and to supply inspiration for adapting these marvelous styles to present-day use. The difficulty of securing the two volumes, their unusual size, and the fact that they have dealt chiefly with elaborate work have hitherto prevented their wider use.

¶ A new, enlarged and improved edition of this important work overcomes these objections. The page size of the volumes has been considerably reduced, their contents much enlarged, and the additions to the subject matter deal largely with work of the simpler, more moderate character which is adaptable to use in America today. The two volumes abound in illustrations of exteriors and interiors of domestic buildings, and these illustrations are supplemented by countless drawings of details,—half-timber work; chimneys; wall paneling; doors; door and window surrounds; mantels and chimneypieces; ceilings; stairways; interior vestibules, and the other details which mean so much to the designer and aid so powerfully in creating the atmosphere belonging to these English styles.

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with power in writing and with poetry in illustration. America's steady growth as an industrial organism is depicted parallel with Russia's yearning toward the transcendent human relationship, now changed from God to man, to man and organized society; a yearning born of the frustration of armies of Russians in the war now seeks fulfillment through the technical ability of America to equip society on a collective scale.

In Russia this phenomenon finds expression in the striving for a utilitarianism out of proportion to the means of attaining it. Contrasted are illustrations of the building of a skyscraper in Chicago and a power station in Kief. The building in Chicago springs like a plant from the ground, carrying its own structure and adding cell on cell to its organism; that in Kief resembles the laborious conjuring of a phantasy. For its scaffold, a Russian forest is moved like Shakespeare's wood to the site, and in its branches primitive man squanders material. America has also its thirst to transcend the everyday realization of a technical adroitness,—to express a greater America, wherewith America loses itself in ornament. Nearly all efforts at impressing ourselves in this way Mendelsohn meets coldly, with nothing like the feeling that a justly conceived aspiration is successfully reached. Contrasted with the Iberian gate in Moscow, the Church of the Transfiguration and Wassilij Blaschennyj, anything America has to show in the matter of decorative feeling must of necessity appear impoverished. That the Russians in their detail can also produce trash is exemplified by the Church of the Resurrection. The Russian rush to use of glass and steel, factory chimneys and reinforced concrete is condemned as an illogical substitution of media in expressing idealism. Some of the German feeling for material pushed to its logical final expression has been grasped by the Russians without adjustment to other architectural considerations,—the technique of making these dreams practical, the understanding of how to make them suitable to Russian climatic conditions and Russian economic life. America possesses technique and common sense. Russia, alas, monopolizes imagination and vision and daring. Of New York's "Gateway of the Nation" Mendelsohn says pithily: "It is not alone America's size and wealth which are pathetically symbolized in the Gate of the World."

As the filling in this sandwich, Europe's position is that of adjustment to a situation full of peril and fraught with problems. Europe is pictured as antagonistic to the changing newer world,—out-distanced in wealth and power by America at the start, too spiritually inelastic to make the Russian leap, and too divided for taking concerted action. Yet Europe was ever the *locus* of good sense and genius, of wisdom, and invention. Let Europe concentrate on itself, and in so doing it will concentrate on the constructive basis of the world edifice and the world law. Among the European buildings illustrated in this volume the author reserves the palm for several Dutch structures,—the airdrome at Orly; and with justifiable lack of reticence, his own textile factory at Leningrad. Some slips of logic on the part of Le Corbusier are noted without proffering the usual consolation of reference to him as a "poet." In "America, Europe and Russia," Mendelsohn has, himself, achieved poetry and also an exposition founded on an interest of which not one section but the whole world is the scope.

College Architecture in America

Its Part in the Development of the Campus

By

CHARLES Z. KLAUDER *and* HERBERT C. WISE

Music Building, Smith College
Delano & Aldrich, Architects

A NEW and ever higher standard is being established for the architecture of educational structures of all kinds. Some of the most beautiful buildings in all America are those venerable halls in academic groves in Charlottesville, Cambridge, Princeton and elsewhere built by early American architects, and now after long decades of indifferent designing and careless planning ~~American~~ architects are rising anew to the situation and are designing educational buildings of every type which closely rival even the best work of a century ago, while in planning and equipment they establish a standard which is wholly new.

¶ In this valuable and important work two widely known architects of educational buildings collaborate in reviewing the entire situation as it applies to college and collegiate architecture. They have carefully studied practically every important institution in the country, and in their text they discuss administration buildings; dormitories; recitation halls; chapels and auditoriums; gymnasiums; libraries; and structures intended for certain definite and specific purposes, such as the teaching of music, all this being well illustrated with views of existing buildings and in many instances with floor plans and other drawings. A valuable and extremely practical work to add to the equipment of any architect's office.

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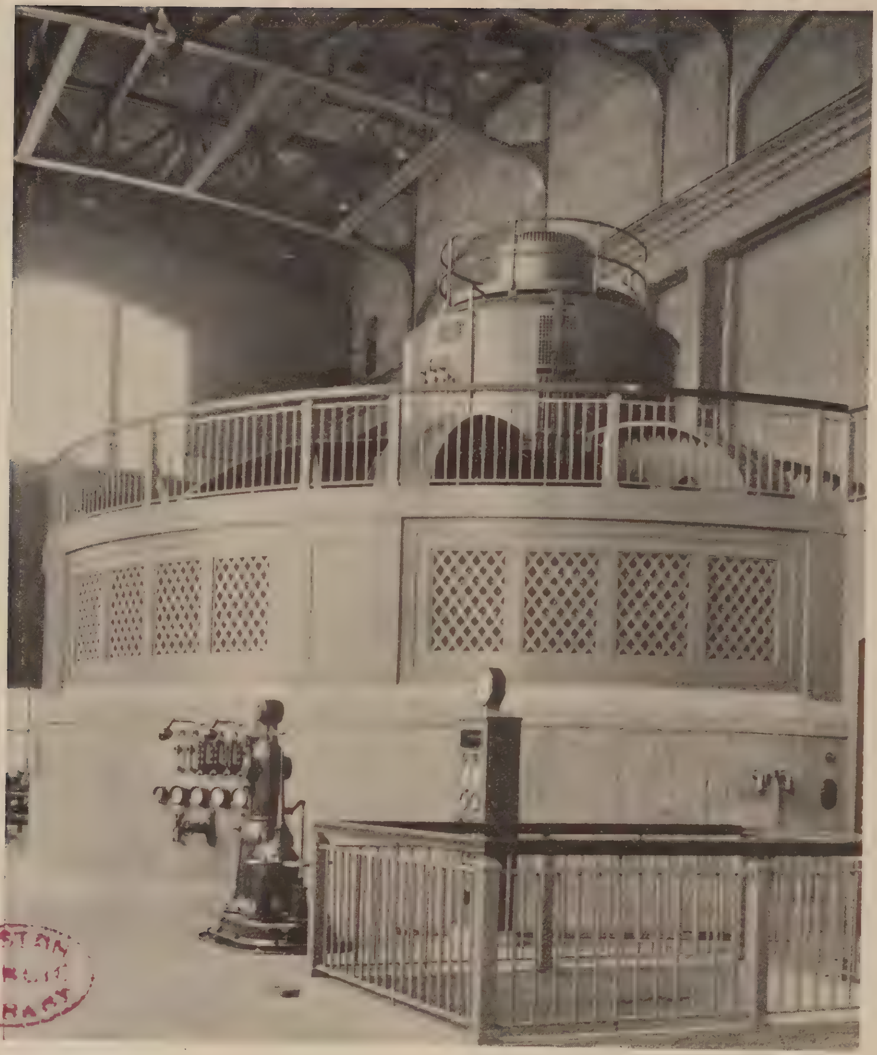

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SEPTEMBER 1929

ROOF TYPES FOR INDUSTRIAL BUILDINGS

BY
CARL de MOLL
ARCHITECT AND ENGINEER, THE BALLINGER COMPANY

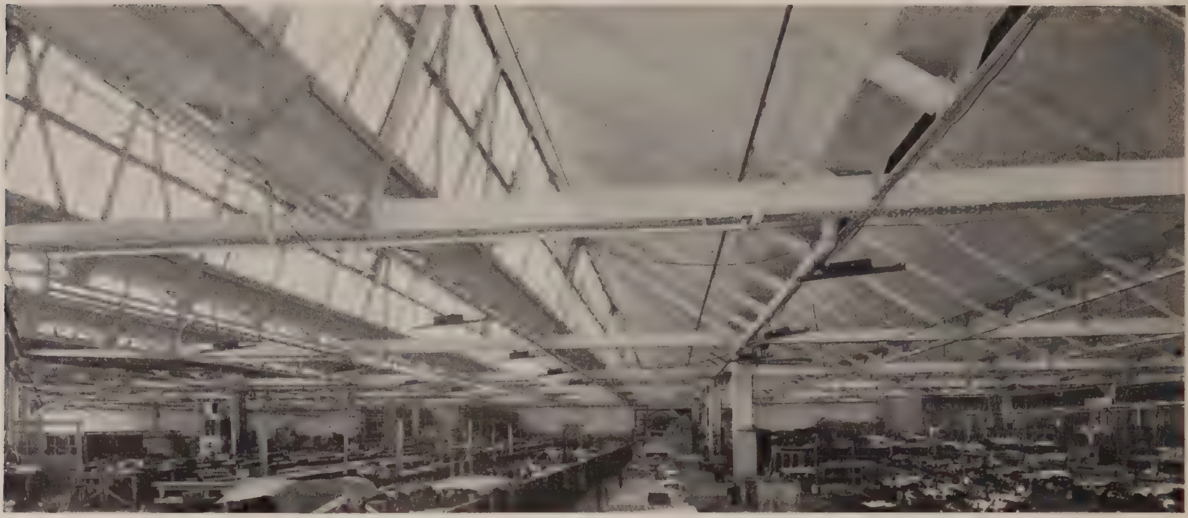
ONE of the modern archæologists, writing on the development of religious and domestic architecture, considers that the roofs of various buildings are designed in accordance with the ancestry of the people,—whether they are descended from a nomad tribe living in tents or from a clan of troglodytes inhabiting caves. From this he deduces the development of the domed roof in one civilization and that of the peaked roof, carried by posts or trusses, in others. While this is an interesting speculation historically, it has little bearing on modern design.

The roofs of modern buildings are divided, however, into two classes. Roofs of municipal, religious and domestic buildings are designed either for shelter and to keep out the weather, or æsthetically for architectural effect. The roofs for industrial buildings, however, while purely utilitarian, must be designed for a number of different functions. A roof is usually considered simply as a cover for protection from the elements, but as applied to an industrial building, there are many considerations, almost the only function in common being to keep out the rain. Roofs are designed to keep out the sun and also to admit the sun; to keep out the air and also to let out air and gases; and to keep out the light and also to admit the light.

The simplest form of roof is, of course, that over the narrow building, with wood joists spaced closely together, boarded on top, and with some covering of felt or metal similar to that of a small city house. As industrial buildings become larger and more complicated, and as modern production becomes more complex and requires larger units, it is necessary to reduce the number of columns to get wider spaces for modern machinery. This has led to the use of heavy girders and various forms of trusses, the simplest form being the "A" truss, high in the center and low at the eaves, giving a distinct pitch in two directions, with a monitor or two-sided skylight at the apex, where light is needed and sunlight is not objectionable, or a single saw-tooth along the north side so as to afford light without direct sunlight's entering the building. This, of course, is only possible where the trusses run north and south. The trusses of a Howe, Pratt, Warren or lattice type can be used, and these are made of either wood or steel, depending on the length of the span.

In a roof constructed of steel trusses, the columns should be fireproofed, and unless the roof is very high above the floor, all of the steel should have a fireproof covering of concrete or some similar material. This is not so necessary in a building equipped with automatic sprinklers, but it should be considered, especially where the spans are large and where the destruction of one truss would wreck a large area of roof. There have been a number of very interesting types of wood trusses developed, some of which are made of relatively thin material, spiked together without the use of heavy steel rods. These are usually of some form of the lattice truss, and can be made with flat or curved top chords and have even been designed for an extreme overhang for use in grandstands of race courses, where a line of posts along the front would be very much in the way. These are, of course, much cheaper than a steel truss of the same span.

In some modern manufacturing plants in this country, where the buildings are several hundred feet wide and over 1,000 feet long, the question of providing proper ventilation is very serious, due to the fact that in the summer most of our prevailing winds are from the west and south. This means that it is difficult to get ventilation through the plant without some artificial assistance. Also in the construction of buildings of

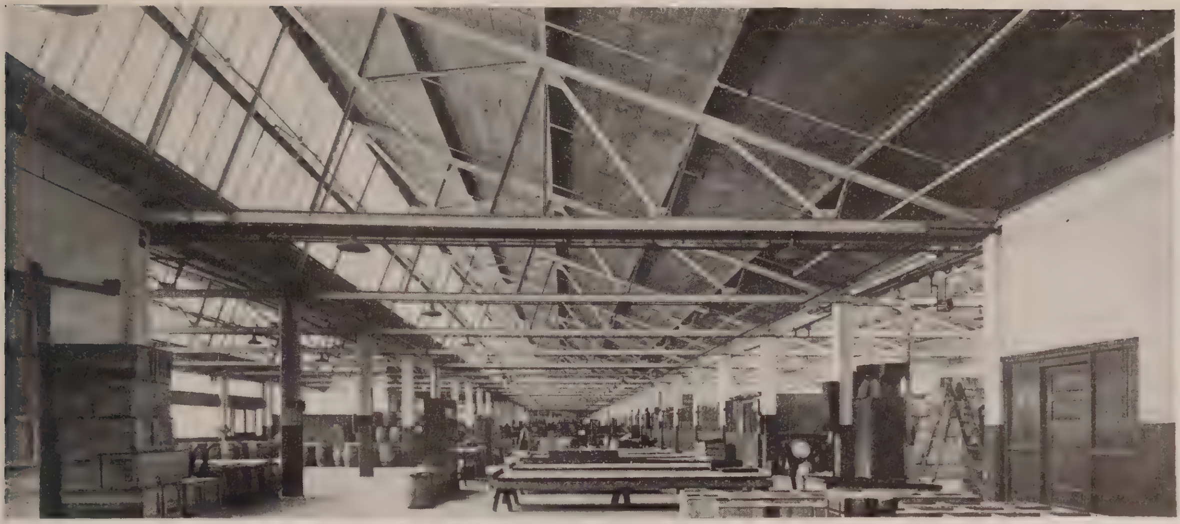


Super-span Sawtooth Roof of the Atwater Kent Manufacturing Company, Philadelphia
The Ballinger Company, Architects and Engineers

these enormous areas, it is necessary to obtain most of the light through the roof. This can be done, first, by the use of glass laid into the body of the roof; secondly, by using flat skylights following the approximate slope of the roof without ventilation; third, by using vertical or slightly sloping sash on the sides of monitors, projecting above the roof surface, these sash, pivoted or hinged, allowing the hot air to escape or fresh air to enter; and lastly, by constructing what is known as the "sawtooth" roof, which derives its name from the similarity between the cross-section of the roof and a saw. These are usually built with the glass facing the north, the glass being either perpendicular or built on a slight slope, and the rest of the roof being solid, sloping from the top of one sash to below the bottom of the next sash to the south. This form of roof affords the greatest amount of light with the least quantity of direct sun at the work level, and as the light is almost entirely from the northern part of the sky, it has a much steadier intensity than light from any other direction. This type of roof was developed in England many years ago for textile mills, and it is still the best for most forms of production requiring strong light.

For many years these sawtooth roofs have been designed with a great number of posts. As these were usually very much in the way, the next development was to raise the entire roof high enough to get a truss of the Howe type to carry a number of skylights across the building. This, of course, raised the side walls and also increased the cubic contents of the building, not only increasing costs, but also increasing the cost of heating. A much more economical method of framing sawtooth roofs without columns is what is known as the "super-span construction." This system was developed and patented by The Ballinger Company, of Philadelphia, and employs both longitudinal and transverse trusses. Back of the glass is an ordinary type of truss which supports the roof longitudinally for a distance of from 60 to 70 feet. These trusses, in turn, are supported at intervals of up to 70 feet by a heavier transverse truss whose bottom chord is at the same level as the valleys, and whose top chord extends outside the sawteeth, connecting their peaks one to another, the structural members of the skylights becoming the struts and braces. It is similar to an ordinary bridge truss, except that the angles of the web members are not equal in each pair. With this system of framing, spans of 100 feet in width and of any length are constructed at only a slightly greater cost for the building than for a sawtooth roof constructed on columns in each valley. If widths greater than 100 feet are to be roofed, a row of columns with a maximum spacing of 70 feet is required for each 100 feet. In the spacing of a large number of similar machines in a limited floor area, we find that the omission of columns is of great importance. In a building 100 feet wide, roofed with a clear span, it is frequently possible to put from 15 to 20 per cent more looms than in a building with three lines of columns.

Another type of roof construction is the arch, which may be of masonry, concrete, bow-string truss or a type of lattice truss. One of the best examples of roofs of this character was the steel arch roof formerly over the train shed in the Broad Street Station, Philadelphia, which



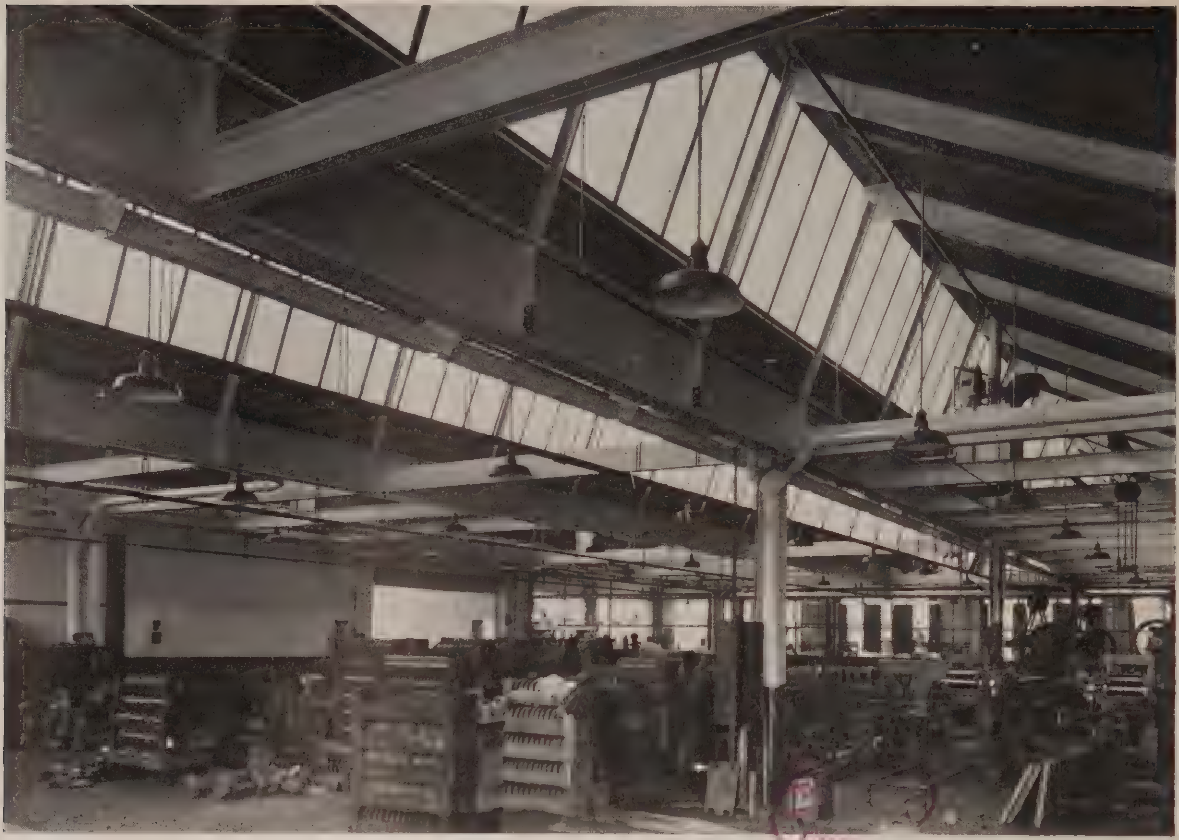
Sawtooth Roof of the John Warren Watson Company, Philadelphia
The Ballinger Company, Architects and Engineers

had a span of 300 feet and a rise of 108 feet. This was destroyed by fire, and as this type is very expensive to build, and very high in maintenance cost, it is, undoubtedly, obsolete.

There have been a number of roofs built of the curved truss similar to a Howe truss, in which the thrust is taken care of by tie-rods. In continental Europe a large number of factories are being built with concrete arch roofs of up to about 50-foot span. These are very interesting pieces of construction, due to the extremely economical use of material. A roof of 45-foot span is built with a 4-inch concrete slab with a rise of about 8 feet, and with a radius of about 32 feet. There are ribs of 6 x 8 inches spaced on 16-foot centers, with reinforced concrete tie-beam of about 6 x 8 inches at the spring lines under each of these ribs. These roofs look very well and are remarkably economical in continental Europe, due to the fact that building materials are relatively high in price and labor costs very low. The writer does not know of any case where these have been used in this country. There are, of course, many shapes and designs which have been used for roof construction, due to irregularities of plant or unusual conditions, but in industrial construction, it is more economical to use the simplest form possible, designing beams or trusses to use standard shapes.

The construction of the roof between supports may be concrete slab, either stone or slag concrete, or concrete made of cinders. These concrete slabs are erected with wood forms, or in some cases with a stiffened wire reinforcement, upon which the concrete is applied without supporting formwork. Another similar type is built of corrugated galvanized iron with concrete slabs, without reinforcement. Other types are cast gypsum, either cast as in the case of concrete, or made of slabs of gypsum cast in forms on the ground and set in place; wood plank or large slabs made of baked terra cotta tile, cement, concrete tile or a tile made of asbestos and cement. There are also roofs simply covered with corrugated galvanized iron or corrugated asbestos lumber. Most of these types of roofing, of course, have to be covered with some waterproofing material. Where the roof is steep, it can be covered with wood shingles, asphalt shingles, asbestos shingles, felt roofing combined with either tar or asphalt, with or without a crushed slag or stone surface, or in some cases with a prepared felt roofing which is applied in long sheets cemented together along the edges. Where the roof is flat, it is necessary that this felt roofing be an impervious membrane, as there is always danger of a certain amount of water's remaining on the roof during or after heavy rains. Where the roof is used as a promenade, or where there is much foot traffic over it, it is necessary to apply terra cotta tile or heavy slate on top of the membrane to take the wear.

In all roof coverings, the most important point seems to be the flashing, that is, where the roof connects with gutters or connects to the side walls, most of the leaks occurring at these points, and as this portion of the roof is usually the flattest, most of the walking over the roof, and therefore most of the damage to the roof, takes place at these points. The ideal flashing is one that is water-tight, flexible, and not affected by temperature changes, as the difference between temperature in the sun in summer and the extreme cold in our northern winters, will amount to nearly 170 degrees, sometimes more.



Sawtooth Roof of the Building for Leland Electric Company, Dayton
The Ballinger Company, Architects and Engineers

One of the most important questions in the design of a roof is the condition of temperature and humidity which is to be maintained inside of the building. We are tending more and more to carrying certain ideal atmospheric conditions inside of our manufacturing plants, without regard to conditions outside. For many years it has been necessary to humidify most textile plants, not only to keep the fibers in proper working conditions, but also to avoid formation of static electricity. We find today that more and more plant owners are desiring a very accurate control of humidity, that is, within one or two degrees. This means not only humidification in the winter, but de-humidification in the summer, and with this high humidity, great care must be taken not only with the insulation of the roof, but frequently with many of the structural members. The water from the atmosphere will condense on the various parts of the roof and drip to the floor, and on the machinery or material in process of manufacture. We are, therefore, using fixed glass in our sawtooth skylights, putting adequate condensation gutters under this glass, and insulating the roofs with cork or other insulating material. Even in buildings where excess humidity is not a factor, we find in the far north that the insulation of a roof is frequently economically justified, due to the large reduction in the cost of heating the top story. In certain plants, where there are corrosive fumes, it is necessary to use non-corrosive metals in the flashings and the sash bars. These are made of Monel metal in some cases, and in other cases, of lead.

The most important thing in the construction of roofs of large areas is the recognition of the relatively large amount of expansion and contraction of the entire roof, due to temperature changes. This imposes serious strains on roof flashings, and on metal sills of continuous skylights. Failure to compensate for these stresses is the cause of the majority of roof leaks in buildings of this character. As our modern civilization is so intense and all work is done at such high pressure, it is important that every building should be designed for the most efficient use. Only in this way can the fatal date of obsolescence be moved far ahead in the future. We know that by careful design, a building is available for use a great many more years than formerly. It is, therefore, imperative in the designing of a modern production plant, that the best engineering service be obtained, as only by the employment of experienced experts in architecture and engineering is it possible to obtain the best and most efficient building for the least expenditure of the manufacturer's money.

FLOORS AND FLOORING FOR INDUSTRIAL BUILDINGS

BY

WALTER M. CORY

CONSULTING ENGINEER

THE selection of proper floor wearing surfaces is of prime importance in the design of modern industrial buildings. The floors are subjected to a large variety of severe services, and failure of the floor surface to stand up under operating conditions may cause damage to merchandise or structure resulting, directly or indirectly, in appreciable financial loss.

The careful designer will make a thorough study of general and special requirements in each division and sub-division of a plant and then select a suitable wearing surface for each. In studying the subject of floor wearing surfaces, it is necessary to inquire very thoroughly into the work to be performed thereon. Often a rather obscure condition, such as water or oil drippage from manufacturing processes, will eliminate use of a surface which would otherwise be ideal. Often requirements are so exacting or conflicting that no known floor surface properly meets the condition, and the designer is forced into unsatisfactory experimentation, or else he must openly use that which most nearly conforms to requirements.

Economic considerations naturally play an important part in the selection of floor surfaces. One must not only take into consideration the initial cost of the floor in place, but must also include the cost of any special finishing treatments, increased structural costs due to the possible added dead load, and maintenance costs, and at the same time obtain a satisfactory equivalent rental cost for the entire structure. Another important consideration which must not be ignored is the reluctance of financial and loaning interests to view single or special use buildings with the favor accorded general or multi-use structures, for obvious reasons.

The floor designer should generally use recognized standards except where occupancy demands special treatment, and in selecting these surfaces he should choose that most adapted to other uses and requiring the least amount of special construction for its proper installation.

The present-day industrial plant usually covers a very wide range of operations in which a dozen or more types of floor treatment are required to properly meet the needs of a single building. No one flooring material is adapted to all the different manufacturing processes.

A typical industrial plant manufacturing a commodity combining textile, metal and wood working departments may call for use of all these kinds of floor surfaces throughout the building:

Tile Used in an Entrance Lobby

Embossed Linoleum in Office Space

Battleship Linoleum Floor in the General Offices

Entrance lobby	*marble.*
Passenger elevator floor	*rubber tile.*
General office	*linoleum.*
Private offices	*carpet.*
Drafting room	*hardwood.*
Receiving and shipping dept.	*metallic hardened concrete floor.*
Sewing machine rooms	*factory maple.*
Machine shop and press room	*wood block*
Plating room	*mastic.*
Foundry	*earth.*
Toilet rooms	*glazed tile.*
Stairs and passageways	*concrete, with non-slip abrasive metal.*

It does not follow that a proper selection of floor surfaces for one building will apply to another structure, even if used for manufacturing similar commodities. Different processes, methods of handling, class of personnel, location and financial considerations would probably result in quite a different selection of floor surfaces.

The designer should acquaint himself with the early history of the subject, as this will be of great value in getting a proper perspective. A brief historical sketch of the subject during the last quarter century may be of general interest, as the evolution of this phase of industrial building design has been influenced by the general trend toward economical, effective, fireproof and sanitary factory construction.

The industrial building in common usage about the beginning of the twentieth century was the so-called "mill type" structure. This type consisted of brick bearing walls with timber columns, girders and hardwood flooring over wood joists. Good prime hardwood was then economical and readily obtainable, and it made excellent floor wearing surfaces, particularly for the textile industry.

Several serious fires focused attention on one of the shortcomings of the mill type building and finally resulted in a modification of the design and produced the "slow-burning type mill" building. This type of construction retained the brick bearing walls and timber columns and girders, but called for all timber to be planed and free from sharp corners, and substituted timber beams spaced from 4 to 6 feet apart with planed, splined, plank underfloor and a hardwood wearing floor.

Iron and steel soon entered into the construction of these buildings, first by the substitution of Lally columns for the wood columns, and later structural steel was substituted for the columns, girders and beams. The use of structural steel in building construction work made it possible to construct higher buildings without too much loss of floor space due to columns, and the use of the bearing wall type of building gradually gave way to that of the skeleton type of construction, which, as its name implies, depends

Rubber Tile in the Cafeteria of Textile Machine Works on a skeleton for its strength, and the materials composing its enclosing walls, floors, etc., are primarily determined by other than structural considerations.

The transition to structural steel developed the need of fireproofing the structural members. In the slow-burning mill type buildings, the plank underfloor had served to carry the floor load to the beams. It was necessary to use fireproof construction to carry the floor loads to the beams and floor arches. These were first of masonry, and later concrete arches were developed to meet this requirement. At first the hardwood floor wearing surface was retained on top of the fireproof arch, but progress in the use of concrete gradually made this material a contender for the floor surface as well as for the supporting arch.

Concrete was used in industrial building work to a limited extent early in the century, but many years elapsed before reinforced concrete began to make serious inroads on the older types of construction. With the improved design of exteriors of this type of building, introducing architectural effects in the concrete itself, as well as using brick veneer, reinforced concrete soon practically dominated the multi-story industrial building field, and concrete has become a strong competitor for supremacy as a floor wearing surface. This material has many of the basic requirements of the ideal floor for general purposes and receives full recognition in present-day floor design. It is economical in first cost; the wearing surface may be considered part of the structural design; it can be made hard, practically impervious, sanitary, fireproof and inert, and is almost universally obtainable. Concrete has its limitations as a floor surface, however, and will not satisfactorily serve for numerous special uses. Oil and acid have injurious effects on concrete; water on floors, if in quantity, will penetrate the minutest cracks in suspended floors; application of intense heat will cause concrete to disintegrate; alternate applications of heat and water are likely to produce spalling. Hardening of concrete is influenced to some extent by the weather and the method of finishing as well as by the mechanics or workmen doing the actual finishing. It is, therefore, more or less nonuniform. Hardness, too, militates against its use in many cases, and the more decorative and artistic floor surfaces supplant it in others.

Machine Shop Floor of End Grain Wood

Metallic Hardcured Concrete Floor for Heavy Duty

The floor surfacing industry has been experiencing steadily increased demand to meet both economic and special requirements, and we can look for considerable activity in this field. The enormous increase in the use of metal in almost every commodity has resulted not only in a demand for floors capable of withstanding the heavy duty entailed but also many complementary services in such places as plating rooms, rust-proofing rooms, etc. The early foundries were in one-story buildings with earth floors, but it is

Applying a Coating to a Concrete Floor to Make it Hard and Dustless

not uncommon now to find these activities on upper floors of multi-story buildings, and the floor wearing surface must meet the requirements.

No attempt has been made in this article to recommend any particular type of floor, as each may be used to advantage by the skillful designer, and the confines of such an article are much too small to treat even one material exhaustively. In my practice, I check each material against the two requirements always present,—first, the service required, and, second, the cost of such surface treatment.

In general, concrete should receive first consideration in the floor wearing surface for any given service. It is usually possible to add a hardener, a waterproofing ingredient, or a coating to meet the majority of the general requirements. Concrete fails to meet many of the special requirements, and this fact opens the door to use of a large variety of special floor surfaces.

Depletion of the forests has made prime hardwood too expensive for industrial floor surfacing, except where its qualities are specifically required. This material makes a clean, resilient, warm and serviceable floor and is widely used, as flat grained maple for textile rooms and recreation spaces, and as end grained blocks for machine shops and similar usage. Oak also may be used to advantage under certain conditions.

Marble, travertine, vitrified tile, brick, slate and stone represent a class of wearing surfaces which are being used in increasing quantities in industrial building lobbies, entrances, etc., along with the growing demand for the display of a reasonable amount of individuality and æsthetic expression in the modern industrial building rather than viewing the structure as a mere enclosure to house an industry. General composition, individual taste, and financial consideration will usually dictate the choice of the materials.

Linoleum, rubber tile, carpets and composition floors are of a group which have numerous special uses in the industrial building and are particularly adapted to office use.

Mastic floors have proved exceptionally effective where acids or large quantities of water are encountered, and considerable success has been had in using this material for heavy trucking such as is common in printing plants.

The earth floor probably is without equal for the foundry floor, and it is used wherever possible for this occupancy. We have been discussing the adaptability of various materials for floor wearing surfaces in industrial buildings under the assumption that proper preparation, application, workmanship, protection and care in service are provided in each case.

If proper bond is not obtained between the sub-floor and the finished floor, the floor surface is likely to break down due to causes which would not affect the floor if a good bond were secured.

Proper workmanship is just as important as the correct design or use of proper materials. One must remember, too, that even after satisfying these three conditions, failure may result, for well bonded, well laid floors can easily be ruined by careless or insufficient protection immediately after laying and before the process has been completed.

If a floor is to give good and lasting service, it must not only be well designed, of proper materials and of good workmanship, but it must be known that the bond between the floor and the floor surface is complete, that the material has been protected from water, heat, cold, being used, etc., or if it be of a type which requires special finish after being laid, that the special treatment has been expertly given, and, last but by no means least, it must be serviced or maintained by the application of the several treatments which may be required depending on the material used, such as waxing, oiling, the use of water for cleaning or its non-use, etc. These special treatments as to the care of the floor should be insisted upon by the designer to the extent that he should see that full and complete instructions are placed in the hands of the owner and their importance forcibly brought to his attention.

It is only by adhering to all these principles under the present development of floor service treatments that the designer can hope for success.

ESTIMATING THE COST OF INDUSTRIAL BUILDINGS

BY

H. H. FOX

VICE PRESIDENT, TURNER CONSTRUCTION COMPANY

THE three usual kinds of estimates of the costs of industrial buildings are: (1) the cubic foot estimate; (2) the square foot estimate, and (3) the quantity survey. It is assumed that for the readers of THE ARCHITECTURAL FORUM no definition of these terms is necessary. The cubic foot basis and the square foot basis are similar in accuracy and reliability,—it might be more correct to say, in inaccuracy and unreliability. Neither is of any value unless used by a person of judgment and experience. Both experience and good judgment are needed.

A fourth method involves a compromise between the cubic foot estimate and the quantity survey. It might be called the "broken down" cubic foot method. It is based on a tabulation of the cubic foot cost of every trade in a number of actual buildings. Heating, for instance, in a series of industrial buildings, may vary in cost from 1¼ cents to 2½ cents per cubic foot; plumbing from .8 cent to 2 cents. When a sufficient number of analyses of this kind are available, it will be possible by considering the requirements in each trade separately to build up a total cubic foot cost for a completed building which will be more reliable than the cubic foot cost as usually determined.

This table shows cubic foot analyses of four industrial buildings:

Building No.	(1)	(2)	(3)	(4)
Structural Trades:				
Excavation;	$0.012	$0.007	$0.020	$0.007
Piles;	...	...	...	.014
Reinf. concrete;	.079	.077	.100	.075
Miscel. iron;	.004	.004	.005	.003
Masonry;	.005	.004	.008	.007
Windows (including glazing);	.004	.006	.006	.010
Roofing and S. M.;	.003	.003	.002	.004
	$0.107	$0.101	$0.141	$0.120
Finishing Trades:				
Cement floor;	$0.009	$0.006	$0.005	$0.007
Ext. cement finish;	...	.001	.002	.004
Doors, millwork and hardware;	.007	.007	.008	.014
Plaster and M. L.;	...	.001	.001	.002
Painting;	...	.004	.008	.006
Metal toilet parti.;	...	...	.001	.002
Special items.	.001	.002	...	.006
	$0.017	$0.021	$0.025	$0.041
Mechanical Trades:				
Plumbing;	$0.007	$0.009	$0.010	$0.012
Heating;	...	.012	.015	.023
Wiring;	...	.009	.006	.006
Sprinklers;	...	.007	.010	.009
Elevators;	...	.008	.013	.003
Ash hoists;	...	.001	...	...
Stack;	...	.001	.001	...
Tank and supports.	...	.001	.002	.001
	$0.007	$0.048	$0.057	$0.054
General Conditions	0.020	0.026	0.050	0.037
Total (without fee)	$0.151	$0.196	$0.273	$0.252

In determining the proper cubic foot cost to be applied in a given case, these items should be carefully considered:

1. ***Foundation Conditions.*** When tall buildings are placed on soil, especially on city plots where the footings cannot project beyond the building lines, the footing designs become complicated and expensive. New York is fortunate in having rock foundations for so many of its tall buildings. Piles of ordinary length, supporting a building designed to carry average industrial live loads, will add from 2 to 4 cents to the cubic foot cost of the building.

Foundations along a water front or on an old shore line beyond which new land has been made, may be very expensive both because of the depth to which it is necessary to go in order to find solid bottom, and because of old cribs or scows which may be encountered far below the surface and which will interfere with pile driving. The writer knows of one such case where the foundations of a building cost as much as the land on which the plant was built.

2. ***Floor Loads and Column Spacing.*** The cost of a building is increased by increasing the live loads or by widening the column spacing. If we take as a base the cost of a reinforced concrete building designed for live loads of 150 pounds per square foot and having 20 x 20-foot column spacing, the increase in cost per square foot caused by heavier loads or wider column spacing is approximately as shown in this table, assuming good foundation conditions, a height of six or eight stories, and that no structural steel column cores are to be included:

BUILDING NO. 1

Five-story and basement grocery warehouse, 273 by 105. Floors reinforced concrete; flat slab construction; 200-pound live load. Bays 21 feet square. 4-ton soil bearing. Concrete exterior. Total floor area, 166,500 square feet. Area of floors and walls, 229,000 square feet. Volume, 2,072,000 cubic feet

Live Load	Column Spacing 20′ x 20′	Column Spacing 25′ x 25′
150 pounds	0	$0.15
200 "	$0.08	0.25
250 "	0.18	0.37
300 "	0.28	0.48

3. ***Story Heights.*** The square foot cost of a building equals the cubic foot cost multiplied by the average story height. A building costing 25 cents per cubic foot and having 12-foot story heights will cost $3 per square foot. If the story height is increased, the cubic foot cost will decrease because the cost of the floor construction will be divided by a greater height between floors; but the cost per square foot will increase, because there are more wall area, more heating, etc., per square foot of floor.

4. ***Size and Shape of Building.*** The cost of the structural frame of an industrial building,—that is, of the footings, columns, floors and roof,—is about the same per square foot of floor area as is the cost of the walls and windows per square foot of wall and window area. Let us assume a unit of $1.50 per square foot for each, and take two buildings with 12-foot story heights, (A) 50 x 100 feet and (B) 200 x 200 feet. The cost of the frame, walls and windows for one story will be:

	Floor	Walls	Total	Per sq. ft. of floor area
(A)	$7,500	$5,400	$12,900	$2.58
(B)	60,000	14,400	74,400	1.86

This comparison shows clearly why a small building costs more per cubic foot than a large structure. There are other factors which increase the discrepancy, such as job overhead, plant installation, and more expensive heating plant on account of relatively greater radiation.

Quantity surveys are not usually made by architects. When a project is ready for final estimate as a basis for awarding a contract, that work is usually performed by contractors; and there is not much to be said about the actual steps taken in the preparation of a quantity survey which would be of interest to the readers of this article. The New York Building Congress published on February 10, 1925 a paper prepared by a committee of contractors describing the basis of a sound quantity survey and pointing out the pitfalls and errors which most commonly occur; but there seems to be one contractor born every minute who is willing to take work at a loss, and this paper has had no effect on the birth rate.

Estimating in General. There are some points related to estimating which, although they do not come strictly under the title "How to Esti-

BUILDING NO. 2

Five-story and basement printing building, 283 by 140. Reinforced concrete; flat slab construction. 19 by 20 bays. Concrete exterior. Typical live load, 250 pounds. 6-ton soil bearing. Total floor area, 234,850 square feet; area of floors and walls, 330,000 square feet. Volume, 3,010,000 cubic feet

mate the Cost of Industrial Buildings", may well be given heed to by architects in the interest of sound and accurate estimating. First, a specification should not contain the words "or equal." Few articles of different manufacture are "equal"; and only the architect knows whether he will accept an "equivalent" as an "equal." If an architect wants material of a specific manufacturer, he should first satisfy himself by direct negotiation with the manufacturer that a satisfactory price will be quoted to contractors who are to prepare estimates, and then specify the article outright by name. Or, he can name two or more acceptable manufacturers. If he does not choose to do this, he should describe the article and omit any manufacturer's name. Contractors have to gamble enough without having to guess whether an architect considers a Ford "equal" to a Chevrolet, or vice versa.

Secondly, there is the clause which occurs in many "General Conditions" which is grossly unfair and should never appear in a specification: "All Federal, State and Municipal Laws and ordinances and all rules and regulations and requirements of Municipal Departments or other public authority shall be considered and are hereby made a part of the contract. Any labor and materials in addition to that described herein or shown on the drawings necessary to comply with such laws, rules, ordinances or regulations shall be performed and furnished by the contractor." A contractor's responsibility for compliance with laws should be limited to his methods of handling the work.

Do not ask to have bids submitted on Monday mornings. For many hours before a bid is submitted, an estimator has to talk almost continuously to subcontractors in order to reconcile their bids with the plans and specifications. Most subcontract bids arrive in the mail the day before the date of opening the general contract bids. If that day is Saturday, there is a good chance that the subcontractor cannot be reached, and too much remains to be done on Monday.

All work of one trade should be specified under one heading. That sounds elementary; but there still exist specification writers who specify painting under the various headings of doors, windows, ironwork, plastering, or anything else that needs paint. One may stumble across odds and ends of ironwork almost anywhere. This adds to the difficulty of reconciling the subcontract bids with the plans and specifications.

It may seem that a disproportionate amount of space has been devoted in this article to the "cubic foot" and "square foot" methods of esti-

BUILDING NO. 3 (left)

Ten-story and basement loft building, 103 by 100. Reinforced concrete. flat slab construction. 200-pound live load. 3- and 4-ton soil bearing. Concrete exterior. Total floor area, 110,000 square feet; area of floors and walls, 163,500 square feet. Volume, 1,220,000 cubic feet

BUILDING NO. 4 (below)

Four-story shoe factory; F-shaped; 220 by 50, with wing 202 by 50. Reinforced concrete; flat slab construction. Bays 16 feet, 3 inches square. Concrete exterior, with brick curtain walls. Typical live load, 150 pounds. Pile foundations. Total floor area, 87,500 square feet; area of floors and walls, 154,300 square feet. Volume, 1,097,300 cubic feet

mating as compared with the "quantity survey" method; but as a matter of fact, more remains to be learned about the former, and at times they are vitally important. It is often necessary to make a commitment for a building operation before data are available from which a quantity survey can be made; and when the financial soundness of such an operation depends on a slight margin, much depends, as can readily be seen, on the accuracy of the preliminary estimate.

FACILITIES FOR PERSONNEL WORK

BY

HARRY M. TRIMMER

INDUSTRIAL CONSULTANT

THE plant manager usually remarks to the architect "I want a thoroughly up-to-date layout for our personnel work, but the space and equipment must be kept at a minimum." For time and space saving, there are certain fundamentals of good design, equipment and operation in personnel departments, just as there are basic principles in designing a fireplace or a foundry, a kitchen or a concert hall. Ask any plant manager if he would like to save $1,500 a year in his overhead! Yet this expense can easily be incurred by a poor Employment Department layout that requires an extra watchman to guard its entrances and exits and keep applicants from getting into the plant.

This article will review the design and working principles of Employment and Medical Departments, without in any way setting up a standard of perfection. The discussion will be confined to these two sections only, and will not include Training Departments, Recreation Rooms, Wash and Locker Rooms, or other personnel facilities found in many companies. Attention will be centered on the small and medium-sized plant, where economy is essential.

Good personnel layout and equipment make a direct and continuous contribution to effective plant operation and to the reduction of overhead expense. The question is often asked "How much must be spent to obtain good personnel facilities, how much space is required, and what is the best location?" Good layouts and operating methods can be produced with much less money and space than is commonly supposed, provided the needs of each company are carefully analyzed to begin with.

Employment Department. The best location for the Employment Department depends upon the services it renders to applicants and to employees. If it is frequently used by the employees, it should be located where they can reach it quickly and conveniently, and if possible nearest the departments that use it the most. It is commonly assumed, in a company occupying several floors in a building, that the Employment Department must be on the street floor. This is not necessarily the best location, as it might be better to have the department on the second or third floor near the employees it serves, and have the applicants use the stairs or elevator. The fact is sometimes overlooked that when an employee goes to the Employment Department he usually is costing the company money and production, whereas an applicant for employment can spend additional time going to the department without any cost to the company or undue inconvenience to himself. Regardless of where the Employment Department is located it must have convenient access to the street or yard, and have its facilities so arranged that casual inquirers cannot get into the plant while on their way to it or after entering it. This should be arranged without the use of extra watchmen or other persons.

Almost all Employment Departments have frequent contact with the Cashier's Office or Payroll Department, and in some cases the employment manager supervises the shop timekeepers. In some companies the Employment Department pays off employees at termination, and in other companies the employee himself goes to the office to get his final pay. All these different policies must be considered in locating and arranging the Employment Department.

Diagram 1 illustrates an Employment Department combined with a Medical Department, located on the second floor of a four-story factory having 1,000 employees. The one main doorway must serve both departments as entrance and exit for applicants and employees, for factory departments and the street. There is natural light from only one side. The Employment Department has three rooms totalling 494 sq. ft., and the Medical Department, four rooms with 646 sq. ft., a total for the two departments of 1,140 sq. ft. A clerk seated in the Employment Waiting Room, near the large open doorway, can control the entrances to the factory departments and the exit to the street, and in addition can handle inquiries.

In practically every company the steps in hiring are fundamentally the same. Whether or not a separate room or space is required for each step depends on the frequency and intensity of use. For a large company, having many applications and engagements, there would be (a) Waiting Rooms, (b) Application Room, (c) one or more Preliminary Interview Rooms, (d) one or more Test Rooms, (e) a Hiring or Final Interview Room, (f) a Record Room and (g) the Personnel Manager's Office. "But," you say, "that is much too much. I am planning for a smaller company that can afford only limited space." You can probably reduce all the above rooms to two or three and still have a layout sufficient for your small needs. "How am I to

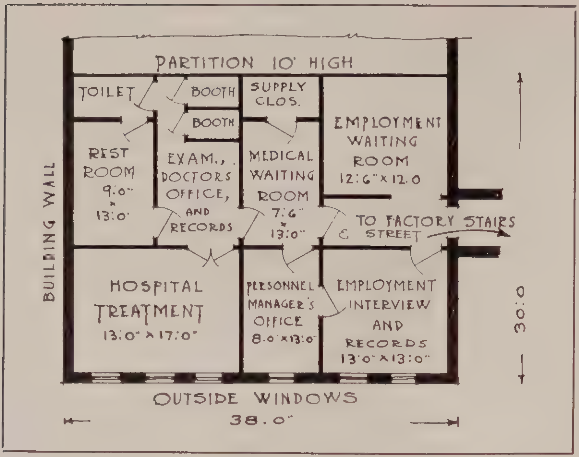

PARTITION 10' HIGH
TOILET
BOOTH
BOOTH
SUPPLY CLOS.
EMPLOYMENT WAITING ROOM 12:6"x12.0
REST ROOM 9:0" x 13:0"
EXAM., DOCTORS OFFICE, AND RECORDS
MEDICAL WAITING ROOM 7:6" x 13:0"
TO FACTORY STAIRS & STREET
BUILDING WALL
HOSPITAL TREATMENT 13:0"x17:0"
PERSONNEL MANAGER'S OFFICE 8.0'x13:0"
EMPLOYMENT INTERVIEW AND RECORDS 13'0"x13:0"
30:0
OUTSIDE WINDOWS
38.0"

Diagram 1. Combined Employment and Medical Departments for a Factory

know how many rooms I should have, for a good up-to-date layout?" Here are some of the fundamentals from the experience of other companies that may help in deciding the plan.

Waiting Room. This is one of the two or three rooms regarded as an absolute requirement. It should be large enough to accommodate the average number of applicants at one time, with definite provision, however, through some expedient, for accommodating the peak loads that occur in every company. Early one stormy looking morning I visited a plant whose employment manager had advertised for a large number of skilled mechanics. . The small waiting room, opening directly on the street, was soon filled and a long line of men formed along the sidewalk. A sudden downpour of rain drenched them to the skin. The higher grade, independent mechanics promptly sacrificed their places in line, more concerned with their comfort than immediate prospect of a job. Only the mediocre and unskilled were left for the employment manager. The money spent for advertising was practically wasted and the expected production from the new men was lost. Worst of all, the rain-soaked men carried a bad impression of the plant in their mind. This is one of the hidden losses that does not show up on the company books. It can be avoided by careful planning. It is not necessary to carry the burden of a large waiting room that is normally only half used; a small room can be used if it opens on a hallway or a stairway, or is adjacent to another room that can be temporarily supervised, or connects with a covered passageway in the yard.

The path of the inquirer from the street, to the waiting room, to the inquiry clerk, and back to the street, should be made as short and direct as possible, with no way of getting into the plant without permission. It is particularly important that the applicant who has been interviewed and either hired or rejected, does not pass out through the same room in which applicants are waiting interviews; see Diagrams 1 and 3. This may seem a minor point but it is important in planning. Let me illustrate its importance. A company had advertised for five milling machine operators. Among the first to apply was a man whose appearance and manner indicated that he was obviously below the standard required by the company. The interview clerk in rejecting him said, "Sorry, but there is no opening for you." In leaving he had to pass through the room where the remaining applicants were waiting, and naturally not having understood the distinction made by the clerk said, "Nothing doing boys, the milling machine jobs are all filled." All the milling machine applicants immediately followed him out, and the employment manager lost some good material.

Some companies require two waiting rooms, one each for male and female; other companies, with less intensive use, permit the two sexes to mingle in one room or set separate hours of interview for each sex. This latter method is practical only under very favorable labor conditions, and where the separate hours are advertised and known to applicants. Much the same remarks apply to one or two rooms for shop applicants and office and sales applicants. The decision depends upon the intensity of use and the policy of the company. A separate waiting room or entrance for employees is preferable so that employees and applicants for employment do not have a chance to engage in conversation. In most smaller type companies, however, one waiting room is made to serve for all applicants and employees, regardless of sex or type of position. Diagram 3 illustrates how even this one so-called indispensable room was omitted. One end of the lobby of the cafeteria and recreation hall was used during interview hours as a waiting room and of course never conflicted with

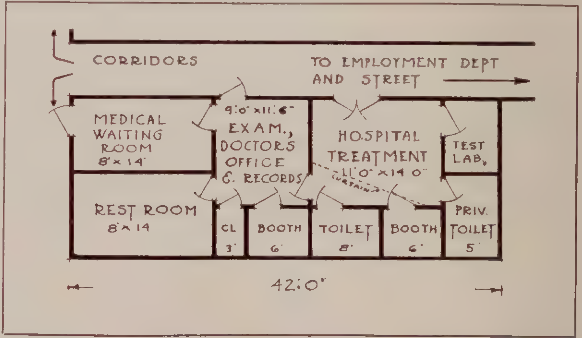

CORRIDORS
TO EMPLOYMENT DEPT AND STREET
MEDICAL WAITING ROOM 8'x14'
9:0"x11:6"
EXAM., DOCTORS OFFICE & RECORDS
HOSPITAL TREATMENT 11'0"x14 0"
CURTAIN
TEST LAB.
REST ROOM 8x14
CL 3'
BOOTH 6'
TOILET 8'
BOOTH 6'
PRIV. TOILET 5'
42:0"

Diagram 2. Medical Department on the Second Floor of an Industrial Plant. Lighted by Skylights

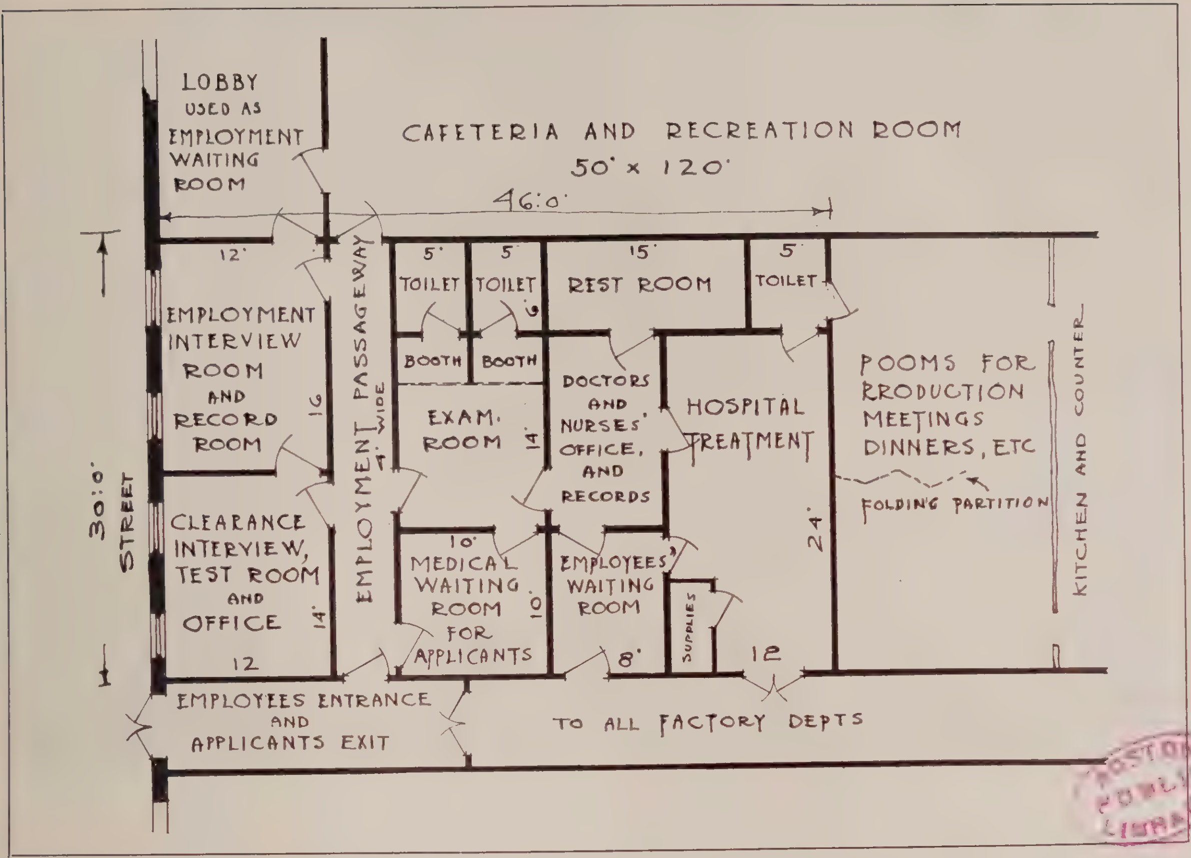

LOBBY USED AS EMPLOYMENT WAITING ROOM
CAFETERIA AND RECREATION ROOM
50' × 120'
46'0"
12'
EMPLOYMENT INTERVIEW ROOM AND RECORD ROOM
16'
EMPLOYMENT PASSAGEWAY
4' WIDE
5'
TOILET
5'
TOILET
15'
REST ROOM
5'
TOILET
BOOTH
BOOTH
EXAM. ROOM
14'
DOCTORS AND NURSES' OFFICE, AND RECORDS
HOSPITAL TREATMENT
ROOMS FOR PRODUCTION MEETINGS DINNERS, ETC
FOLDING PARTITION
KITCHEN AND COUNTER
30'0"
STREET
CLEARANCE INTERVIEW, TEST ROOM AND OFFICE
14'
12
10'
MEDICAL WAITING ROOM FOR APPLICANTS
9'
EMPLOYEES' WAITING ROOM
8'
SUPPLIES
12
24'
EMPLOYEES ENTRANCE AND APPLICANTS EXIT
TO ALL FACTORY DEPTS

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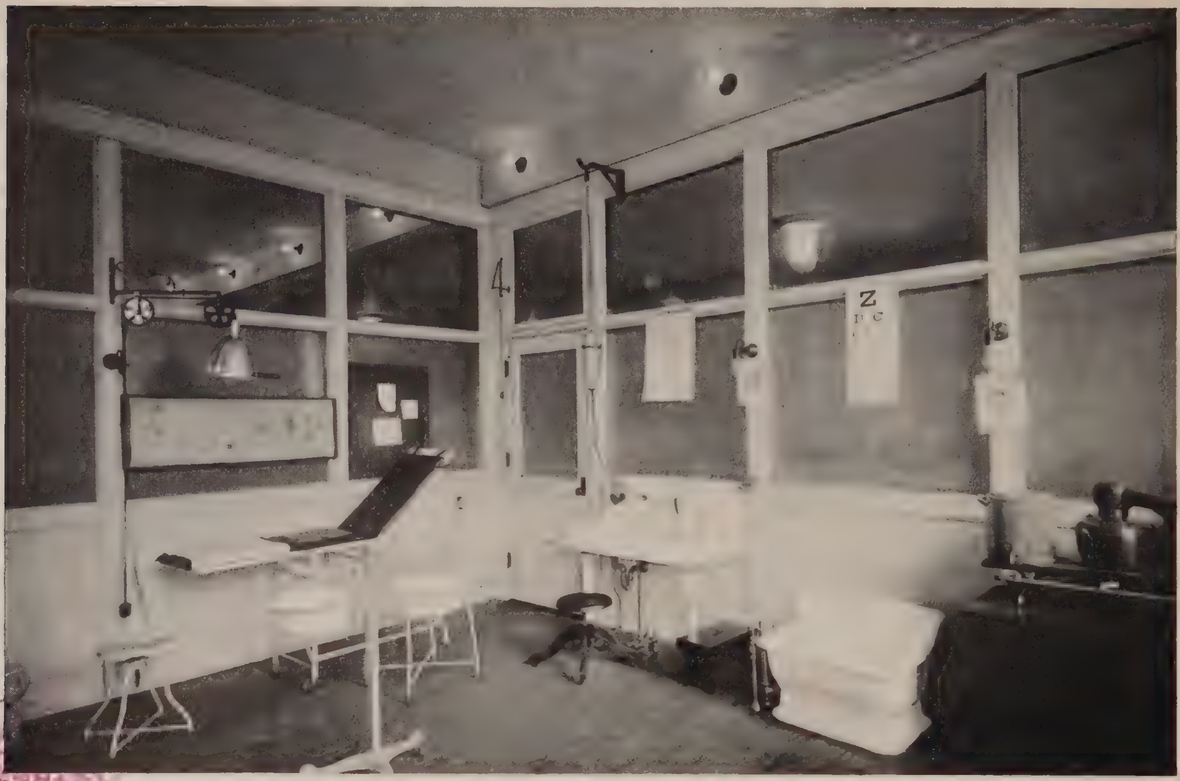
Diagram 3. A Well Arranged Layout for the Employment and Medical Departments of an Industrial Plant
The Ballinger Company, Architects and Engineers

its use as an entrance for other activities due to the difference in the time of its various usages. Approximately 150 square feet of floor space were saved by this method. The layout shows an Employment Department designed for 1,500 to 2,000 employees, of two rooms and passageway, totalling 480 square feet, on the street floor, with exits possible on all sides and having overhead light in addition to windows.

Application Room. "Never heard of one," say some managers. "Must have one," say others. The difference lies largely in company policy and labor conditions. Some companies give practically every inquirer a blank to fill out on the spot even though there is no job open, and use these applications as a prospect file from which to obtain employees when needed. If there are many applicants simultaneously filling out blanks, adequate table or shelf space is of course required. Other managers refuse to give out application blanks, and take a written record only when the applicant is being hired, in which case no separate application space is needed. Between these two extremes, the majority of companies doubtless take their place by giving out application blanks only to likely-appearing candidates for the hard-to-fill jobs. For this limited use, a small part of the waiting room or of the interview room can be fitted with a table or shelf.

Interview and Test Rooms. Here again the question "Are they necessary?" must be answered according to the actual needs of the individual company. Some companies have several small rooms or booths so that three or more persons can be interviewed simultaneously, each booth being shielded as to sight and conversation. The same booths can sometimes be used where hiring tests are given,—for office workers on typewriters, adding machines, etc., and for shop workers by means of manual tests. Whether the interviewing and the testing are done in one room or several, convenient access must be provided to the shop, office and medical sections. This allows for the practice in many companies of sending the applicant to the shop or office for interview by the department head for whom he is to work, and to the Medical Department for physical examination, all of which is usually done before the applicant returns to the Employment Department for formal hiring.

Hiring Room and Record Room. The hiring room, sometimes called the final interview room, can be used, like the old-time barroom, for many purposes. In it there may be combined the func-



Interior of a Well Equipped Room in a Medical Department

tions of taking applications, interviewing, testing, hiring and filing of records. It can be so used with entire satisfaction in companies that do not have frequent applications or engagements. Diagram 1 illustrates this type of use.

Manager's Office. One of the chief functions and contributions of the employment manager is the final clearance interview of employees at termination. Some companies insist that employees, regardless of position, rate of pay or reason of termination, be interviewed by the employment manager himself before an employee can be cleared from the payroll. This office should combine accessibility, privacy and control. It must be so located with connections to the shop and office that employees can readily reach the employment manager when required and that he can as quickly reach them; it must be enclosed or set off to permit confidential conversation in person and over the telephone, and, if possible, it should be placed so that the employment manager has visual supervision over the activities in the surrounding rooms under his control.

General Arrangement. Engineers and architects are frequently called in to analyze and improve methods of producing or handling materials in a factory. Even a slight saving on each unit of production is very properly regarded as worth while. Considering the space occupied by the Employment and Medical Departments and the number of different applicants and employees passing through them, the frequency of use per square foot in these departments is higher than in many other departments in the average plant. A slight saving in time or effort per person is quite as worth while a contribution to the operation of a plant as a saving in handling of materials.

It is trite to remark that good design and equipment are fundamental to such efficient operation. Yet it is astonishing to note how frequently the simple essentials of effective layout are disregarded in these much used departments. Case after case comes to mind,—in one plant, interviewing is frequently retarded and sometimes completely stopped by intermittent distractions in an adjacent passageway; in another, the assistant, and in his absence, the employment manager himself, must go to the next room scores of times daily for records of applicants and former employees because sufficient allowance was not made near at hand to accommodate the files that so rapidly expand in every Employment Department; in another Employment Department, applicants in the waiting room can hear the questions and answers of the clerk and the man he is interviewing; another employment manager must go upstairs to a private room whenever he wishes to talk confidentially over the telephone or to give a private interview, etc. Movable partitions, of wood or steel frames, are convenient for forming the rooms of Employment and Medical Departments, as they can be used with clear or obscure glass either standard height or extended to the ceiling for privacy.

There are few, if any, so-called "perfect" layouts, as in practically every case some desirable features must be sacrificed because of building, space, or money restrictions, to obtain facilities more essential for the department. Careful analysis should disclose these handicaps beforehand so they can be weighed and provided for in other ways, and not learned with surprise and regret after the layout is built and the new department is in operation. Certain defects in Diagram 1 are evident, due to physical characteristics of the building. The space shown in this layout illustrates the requirements, of an average plant employing around 1,000 people. This area could be made to serve a plant of 2,000 to 2,500 if the frequency or intensity of use was not too great. The layout is a good example of the principle of using the space with natural light and ventilation for those rooms used constantly, or by permanent employees, and using the inside, artificially lighted space for rooms used infrequently, or even continuously by transients rather than by the permanent staff.

Have you ever gone to a plant as a customer to buy their product and entered a sales room that was badly furnished and lighted and that had in general a second-rate appearance? Most companies spend real money in dressing up their front hall so customers will get a good impression of their product. The Employment Department is the "front hall" of a company to great numbers of people who favorably or adversely affect production and profits. Yet too often this department suffers from a lack of arrangement and facilities that belie the real standards and character of the company. Floors, walls, lighting and ventilation should be given particular attention. Examination of many Employment Departments will show that bad impressions are created not so much by cramped space, bad arrangement, second-rate equipment, and lack of toilet facilities, as by floors worn with shop and street grime, hand-marked walls, dull paint, dingy lighting, and stuffy air. These latter defects can be easily remedied and yield a return in appearance and effectiveness on both applicants and employees far beyond the cost.

Medical Department work falls into three groups,—(a) treatment of injuries, (b) medical consultation or care, and (c) physical examinations. The type of service rendered under the first of these three will largely decide where the Medical Department should be located. Where injuries are severe, or of a lesser nature but frequently occurring, the Medical Department should be located as close as practical to the source of the injuries; contrarily, there are several excellent reasons for having the Medical Department immediately adjoining the Employment Department, particularly if physical examinations are given at the time of hiring. Some companies are fortunate in that the Medical Department can be near both the factory sections it most frequently serves and also the Employment Department. Where these two departments must be split, the advantage resulting from having the Medical Department near the needs of the employees usually outweighs the disadvantage to the Employment Department staff and to applicants. Diagram 2 is a layout for a Medical Department located on the second floor, with manufacturing departments on all sides and the Employment Department on the first floor. Natural light is obtained overhead from skylights. The space totals 672 square feet. In Diagram 3 is shown a layout that is adjacent to both Employment Department and manufacturing departments, with six rooms, totalling 900 square feet.

The work of the Medical Department usually requires space for the following, although frequently two or more functions can be combined in one room,—(a) Waiting Room, (b) Physical Examination Room or Booths, (c) one or more Treatment or Baking Rooms, (d) Rest Room, (e) Doctor's Office and Record Room.

Waiting Room. When the calls at the Medical Department can be scheduled and controlled, a very small room will suffice. If scheduling is not practical, a larger room must be provided, and in some cases, two rooms,—one for males and one for females. If physical examinations are given to applicants before hiring, it is bad policy to have them wait their turn in the same room in which injured employees are waiting their call to have wounds dressed. The use of two rooms can sometimes be avoided by using a small passageway or by having the applicants report at hours when no dressings are being given to employees.

Examination Room. The steadily increasing use of physical examinations at hiring requires some definite provision for doing this work quickly and at a minimum of floor space. Two or more small booths, in a room partly used for other purposes, permit the physician to examine one man while the next is preparing. These booths can be as small as 3′ x 4′ or 5′, each one shielded as to sight and conversation. In addition, adjacent open space must be available for scales, eye charts, etc. A distance of 20′ is preferable for use in eye examinations, but this is not a requirement, as mirrors can be used to obtain the required distance. It is particularly important that toilet facilities be immediately adjoining the examination space.

Treatment Room. The size of the treatment or hospital room varies widely in different companies. Where the injuries consist of slight cuts and bruises, or where complete hospital equipment used by other companies is available in the same building, this room can be kept at minimum size. Where injuries are severe or frequent, or where additional hospital facilities are remote, the hospital room should be ample to take care of peak loads and to accommodate large pieces of apparatus used for extreme cases. Many companies find it more economical in fees and saving of production to equip this room with special apparatus than to send their injured employees outside for treatment. It is therefore advisable to be liberal in allowing space for future needs in this room and to economize on space elsewhere. Whether a special room for baking, massage, or electrical treatments is required, again must be decided by the needs of each company. In most cases, a corner of the hospital room can be screened off to accommodate one or two pieces of such apparatus.

Complete plumbing facilities are necessary in this room,—hot and cold water, drains, gas outlets and electric plugs. A surgical sink is a requirement for the work of most companies and to somewhat lesser extent a utility or slop sink is necessary. Other fixed pieces of equipment may be desirable. All doors leading into the hospital room and in passages giving entrance to the hospital, should be at least 3′ wide to permit ready use of stretchers or wheel chairs for emergency cases. It is still better to provide double doors, using only one door for ordinary purposes. The walls of the room should be closed to the ceiling,—of heavy materials or of glass,—to keep out noise and dirt but more particularly to keep in objectionable cries and odors that have a habit of occurring in the best-regulated families. For obvious reasons the hospital room should be so located as to obtain outside air and light. Floors in the Medical Department, and especially in the hospital room are usually subjected to heavy wear and yet must be kept in first-class condition. It is wise economy to spend a little more for the first cost of a good floor or covering than to run the expense of frequent scrubbings, patching, or painting. Some companies paint the Medical Department walls in warm buff or tan color. This takes away the glaring, white, "operating-room" look, and has a good mental effect on the employees.

Rest Room. Rest rooms are required by law in many industrial localities. Such rooms are particularly valuable where large numbers of females are employed. Whether one or several rooms are within the Medical Department itself, or are scattered through the plant with a matron in charge of each, is a matter of company policy. These rooms should be of such size and shape as to accommodate the required number of 2′ 6″ x 6′ cots or couches at a minimum use of floor space. Toilet facilities should be convenient to each room if possible. If the rest room is within the Medical Department, it should be arranged so the nurse can conveniently supervise it at all times.

Office and Record Room. Space is usually required sufficient for consultation work by the doctor, clerical work by the nurse or clerk, and for file cabinets of records. These activities may sometimes be carried on in the examination room or the rest room, depending on the frequency of use. Some companies with a full time doctor and complete medical service require a separate room for the doctor. It is customary not to have clerical work or filing of records done in the hospital room, but space for this should be located immediately adjoining it. Most Medical Departments are supervised by one person, and it is advisable to arrange all rooms so that their entrances and exits can be controlled by one person from a central location, preferably from the record room or office where the routine work is done. In Diagrams 1, 2 and 3, the nurse at her desk in the record room can control all other rooms in the department.

DAYLIGHT ILLUMINATION OF INDUSTRIAL BUILDINGS

BY

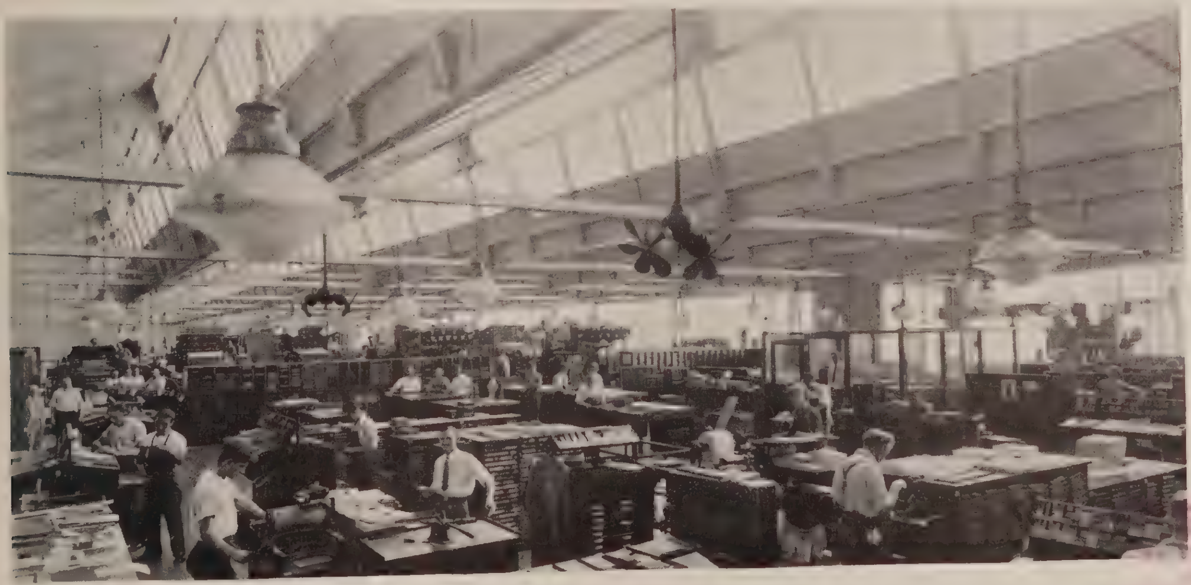
WILLIAM R. FOGG

THE BALLINGER COMPANY, ARCHITECTS AND ENGINEERS

PROBABLY one of the most significant facts now becoming recognized concerning modern commercial, industrial and institutional buildings is that their useful life has been increased during the past quarter of a century by about half. This is evidenced by the change of policy of loaning institutions in increasing the number of years over which mortgage loans may extend, and decreasing the yearly amortization payments on the mortgages. Another evidence is the increasing acceptance by the public of building securities as a conservative and stable form of investment.

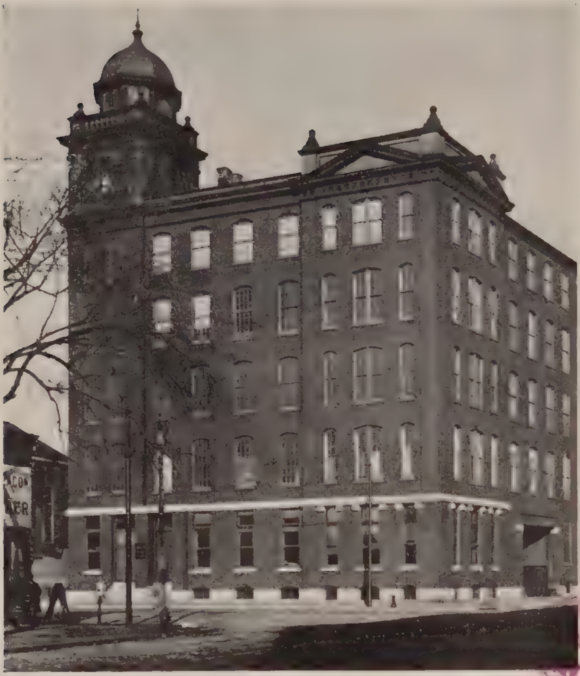
An examination of the reasons for this change will show that buildings designed in accordance with modern standards more nearly approach an ideal solution of the problem of requirements of their occupancy than has ever been possible in the past. This is due to the perfecting of materials of construction and their proper use by architects and engineers for the purposes intended. Almost all the desirable requisites in a building of a given type are now obtainable, which was not true to the same extent at the beginning of the present century. Architectural styles may vary in the future as in the past. As far as the utilitarian requirements of a building are concerned, however, it is now possible by skillful use of materials available to obtain a building of permanent construction almost perfectly adapted to its purpose.

What is true of buildings as a whole applies

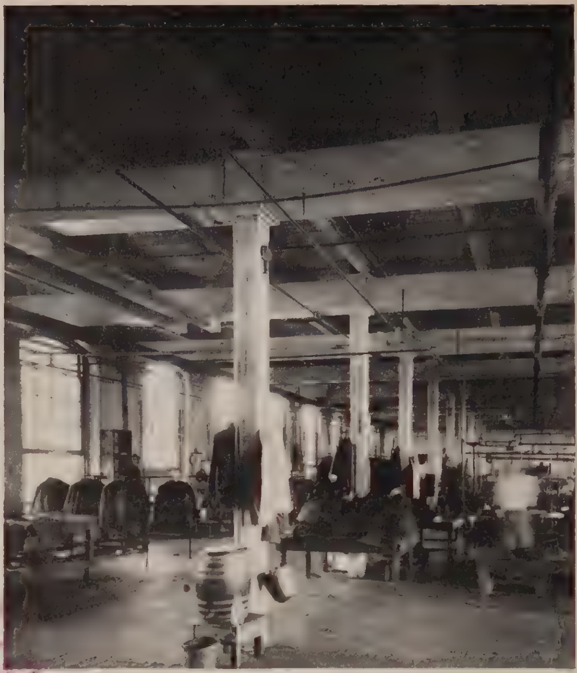


Interior of Modern Printing Plant for Mack Printing Company, Shown at the Top of Page. Sawtooth Construction with Maximum Daylight Illumination and Super-span Truss Construction, Eliminating all Columns

The Ballinger Company, Architects and Engineers



Clothing Factory, Erected 30 Years Ago. Wall and Window Spaces of Equal Width; 15 feet, 9 inches Story Height; 68 feet, 8 inches Wide



Interior of Clothing Factory, Erected 30 Years Ago, Showing Valuable Lighting Space Lost Above Windows Due to Type of Construction Then Prevalent

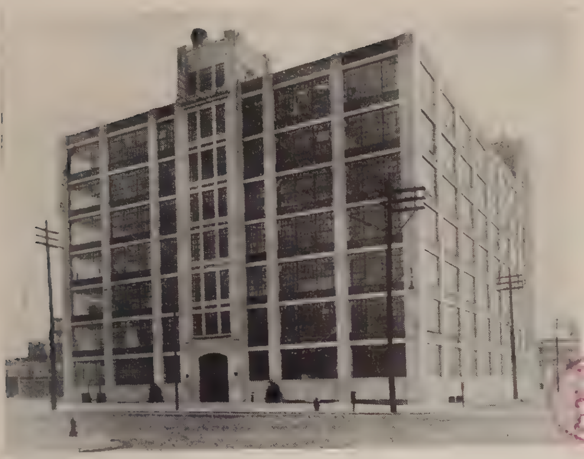
The Ballinger Company, Architects and Engineers

in a notable degree to the important matter of bringing daylight illumination to their interiors. It is now possible to obtain in the side walls of buildings almost any amount of window area which may be required, and the same is true of skylight area in roofs.

Development of window construction has been along the line of greater area of glass and less width of bars dividing the windows into sections. Protection against the elements, including fire, and suitable means for ventilation, screening, hanging shades and cleaning are well provided. Many improvements have also been made in the production of glass itself to better adapt it to particular requirements. Satisfactory glass is now readily obtainable to meet any need for clearness and surface and for the direct transmission or for the diffusion of daylight. Special glass is manufactured for the purpose of excluding objectionable rays, and there are other forms of glass which permit the passage of beneficial sun rays.

Wall Lighting. Due to the materials of construction commonly in use a quarter of a century ago, the practicable wall openings then available in the average building were much restricted in size as compared with those used at present. At that time the ordinary construction was such that not more, and often less, than 50 per cent of the wall area above the window sills was available for windows. Walls consisted of alternate masonry piers and wood windows, the wall and window spaces being about equal in width. Window jambs were quite deep, due to the thickness of the walls. In this construction the wall piers supported the floor beams, the masonry arches over the windows supporting merely the masonry above them to the window sill above. Because of the wood beam floor construction and the arched heads of the windows, some window area was usually lost near the ceiling where it would have been most valuable. In addition, the projecting beams and girders of the floor construction above prevented the maximum penetration and reflection of the daylight by the ceiling.

With modern construction, the usual average of available wall area for windows is from 80 to 85 per cent. This is made possible by the use of concrete or steel frame construction to carry the floor loads, reducing the wall columns to a minimum width and the window jambs to minimum depth. Window lintels are so constructed that the necessary depth is obtained by the beam extending above the floor instead of below the ceiling. This permits the tops of the windows to be at the same height as the ceiling, and is the ideal lighting condition. With the development of mushroom concrete construction, omitting beams and girders, an entirely flat ceiling is provided permitting maximum daylight penetration and reflection. Where conditions require it, the window area can be practical and economical methods of construction be increased to almost 100 per cent. This is done by using



Exterior of Modern Telephone Manufactory for Western Electric Company, Having Window Area of Between 80 and 85 Per Cent

Interior of the Building, 120 Feet Wide, 12-Foot Story Height, Showing Advantages of Flat Slab Construction, Window Heads Reaching to Ceiling

The Ballinger Company, Architects and Engineers

mushroom construction and having the floor slab cantilevered beyond the columns, placing all columns inside the building and omitting wall columns entirely.

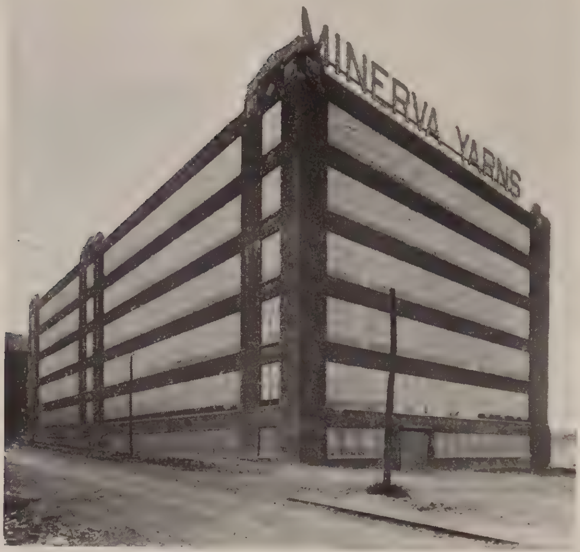
As a result of having the wider windows, made possible by the use of new structural methods, the daylight illumination in the interior of a building is increased more than in direct proportion to the increase in width of the window openings. This is due to the fact that the average illumination is much better with wide windows and very narrow wall columns than with alternate window and wall spacing of approximately equal widths. In general, the doubling of the size of the window is found to almost triple the effective illumination. More important than any increase in width, however, is an increase in the height of a window. As the economical story heights of buildings are somewhat rigidly determined for various occupancies, a variation in this respect above the window sill cannot be great without exceeding the normal cost, so that utilization of all available height is important. This is done to the greatest possible degree with modern construction.

With buildings having an average story height of about 12 feet, the limit of good daylight illumination for average working purposes is reached at about 25 feet from the windows. For distances greater than this, the variation between maximum and minimum is usually more than 3 to 1, which is considered the limit in good practice. For buildings wider than this there remains the choice of increasing the story height, increasing the window area, or using artificial illumination in the more remote areas.

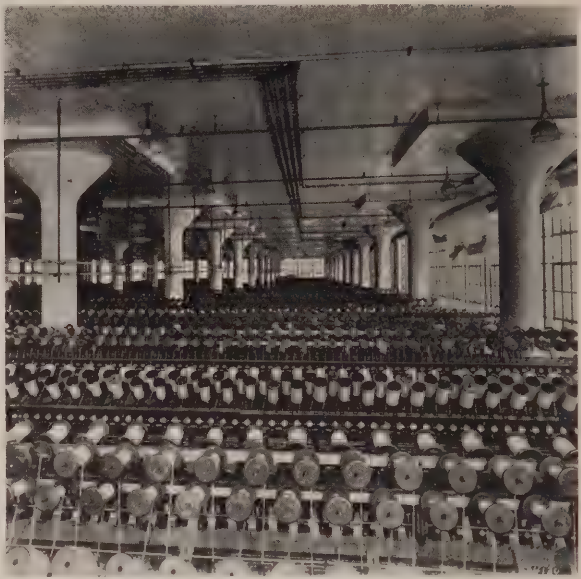
Owing to the fact that light entering the building through the side walls is always influenced by the exposure of the walls in relation to the sun, there results an unevenness of illumination at different times of the day. At one period the illumination is at a maximum, and probably excessive, and at another period it is at a minimum, and perhaps inadequate, except close to the windows. The minimum illumination of a given location therefore determines its availability as working space under daylight conditions. It is estimated that with working hours from 8 A. M. to 5 P. M., in the latitude of New York, artificial illumination is required upon an average of two hours per day during the year in buildings of average width which are dependent upon side wall illumination.

Roof Lighting. To be of the most value for general purposes, light must be as nearly uniform as possible during the whole working period. This uniformity of illumination is best obtained by dependence upon a light source in which there is relatively little variation and which is in all cases at or above the minimum required. This is accomplished by illumination of the building from overhead by a type of construction which will exclude the direct rays of the sun and depend upon the more uniform reflection from the clouds. For this purpose the well known sawtooth skylight type of roof construction is used. It will be evident that if the light is brought through the sides of monitor skylights, instead of through sawtooth skylights, the conditions will be very similar to those which exist with windows in the side walls.

Originally developed for use in textile factories, the sawtooth skylight has been generally adopted by all industries requiring good average daylight without glare. The sawteeth are usually constructed with spans of from 20 to 25 feet when beams are used, and are economically constructed with simple trusses for spans as great as 40 feet. For greater spans a patented type, known as the "super-span" truss, is used, com-



Exterior of Modern Textile Manufactory for James Lees & Sons Company, Showing Almost 100 Per Cent Area of Windows Above Sill Line



Interior of the Factory Showing Elimination of Columns at Wall Line to Obtain 100 Per Cent Window Area; 15-Foot Story Height; 120 Feet Wide

The Ballinger Company, Architects and Engineers

bining two or more sawteeth in one truss to eliminate obstructing posts from the floor area. The glass area in these sawteeth varies with the lighting requirements, being usually between 30 and 35 per cent of the floor area. A difference in practice exists with reference to the position of the glass portion of the sawteeth, some being vertical and others having a slope. When sloping, care is taken to avoid so much slope that direct sun will be admitted to the building. It is unquestionably true that more light will be admitted by the sloping skylight than by the vertical, but as the vertical skylights remain clean much longer than the sloping, it depends upon the cleaning whether one admits more light than the other.

In addition to guarding against excessive slope of the skylight, it is important also that the skylight face directly north, if the sun's rays are to be excluded during the early morning or late afternoon. This is of so much importance that it was obtained at some additional building expense at a plant recently constructed having an area of 1,200,000 square feet of sawtooth roof construction. As the street lines of the lot were at an angle of nearly 90 degrees with the cardinal points of the compass, it was necessary to construct the sawteeth parallel with the east and west diagonal of the building, instead of parallel with the walls. With sawtooth skylights flat glass is most frequently used, although recently corrugated glass has been used with satisfactory results. In either case wire glass should be used for safety considerations, to prevent the hazard of falling glass, injuring employes or machines.

Ventilation of sawtooth skylights is usually effected by having the upper or lower rows of lights, or both, hinged at top and opened outward by means of hand- or motor-operated mechanism controlling any desired length of skylight. With corrugated glass, which is installed without frames, ventilators on the roof are used, or sections of glass are omitted and mechanical ventilating units are installed. In addition to the reflection of the northern sky through the sawtooth skylights, it has been found that the sloping roof of the sawtooth adjoining on the north can be made to reflect some of the light from the south. If instead of slag, which is gray in color and turns dark when wet, white pebbles are used on the surface of the roofing, or a dull-finish white surface roofing is used, an appreciable increase in illumination is obtained. It is estimated that with usual hours from 8 A. M. to 5 P. M., in the latitude of New York, artificial illumination is required upon an average of not more than half an hour per day throughout the year in sawtooth skylight buildings of proper construction.

Window Construction. Wood windows, which were suitable for the small window openings of earlier days, are not well adapted for the larger openings because of the increase in size of members which would be necessary to obtain the same strength as steel. For ordinary commercial and institutional buildings the most commonly used window construction is therefore of metal. Owing to the strength of the metal it is possible to obtain very large glass areas with practically no obstruction from the members forming the window sash, and there is practically no exclusion of light because of them. Originally metal windows were of hollow sheet steel, but these have now generally been displaced by windows having members of rolled steel or other solid metal construction. Steel windows, owing to their standardized construction and their being made by mass-productive methods, can be obtained for all requirements in a highly competitive market.

Steel windows, unless properly protected, are subject to corrosion and more rapid deterioration than wood and for that reason should be painted at regular intervals. Galvanizing of steel windows and other means of metal protection are, therefore, used at times in addition to ordinary painting. One objection to use of steel windows in the past has been the fact that the metal-to-metal contact was not as tight as with wood, and the heat requirements of the building were accordingly increased, due to air leakage. With the better type of sash, however, double-contact surfaces are provided with an air space between, which greatly reduces the air and heat loss through sash openings. Metal windows are produced in a great variety of designs, of both plain and of artistic types. With them, ventilation is provided in an even greater variety of ways than with the original wood windows.

The double-hung sash, originally the most common, probably because of its wooden prototype, which is either weighted or counterbalanced, with top section sliding down and bottom section sliding up, is much less used than formerly. One objection to the double-hung type is that only half of the window opening is available for ventilation at any one time. This has been overcome by having the upper and lower sash pivoted or sliding in such a manner as to obtain the entire opening for ventilation. The most common type of window now in use is the rigid frame with movable sections pivoted on a horizontal axis, one portion of the sash moving in and the other out. Another design is the projected type, having movable sections hinged on a horizontal axis and projecting inside or outside as desired.

Then there is a combination casement and projected sash. This has a section at the bottom hinged at the sill and opening in, providing ventilation without draft, and an upper double casement portion for part or full ventilation when desired.

Cleaning of fixed windows in large areas in factories is only practicable with a scaffold swinging from the outside. Most windows are of the ventilated type, and with pivoted or hinged sash provided with only a single row of fixed panes around the sides, so that it is possible, though not convenient, to clean them through the ventilator openings. Windows of the double-hung type, where not made reversible, are provided with hooks in the frames for the attachment of cleaners' belts when working from the outside. Casement sash are usually cleanable from the inside of the window. Screening of pivoted steel sash openings against entrance of insects at one time presented a difficult problem, usually solved by using an unsightly circular screen. This has been overcome by providing two screens, one above and one below, with spring brass rubbing strips pressing against the sash where pivoting occurs. Conditions of humidity, where condensation is likely to occur at windows, are provided for by means of double glazing and by providing condensation gutters for removal of condensation when formed, without dripping.

Glass. One of the most important improvements in the manufacture of glass on a commercial scale is the new method of producing a flat glass by direct drawing of the sheet from the furnace. A superior product is thereby obtained at a lower cost of production. This process is now rapidly replacing the old method of blowing a cylinder and then cutting and flattening it, with the resultant waviness of surface. Another improvement in glass manufacture was the production of wire glass. With the increase in the glass area in the walls and skylights of buildings there came the need for greater resistance of the glass in order to prevent the spread of fire from one area or from one building to another. This is successfully accomplished by the use of glass in which a wire mesh is embedded to hold the particles together in the event of the glass cracking into pieces. This glass is obtainable in the cheaper rough surface type at a cost of but little more than plain glass, and also in polished plate glass at a moderate increase in cost. Where the exposure is not great, ordinary glass clips and putty are accepted by the insurance companies or authorities, but where glass is likely to crack badly, due to intense heat, glazing angles, securely attaching the glass to the frame around its entire perimeter are required for maximum protection and lowest insurance rates.

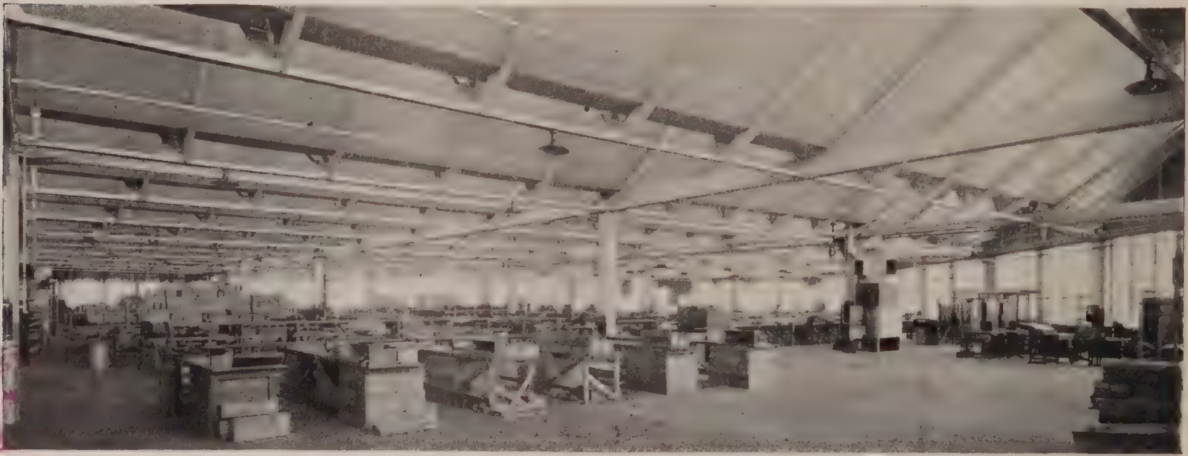
Several kinds of glass are now available which have a diffusing action and re-direct the rays of the sun toward the interior of the building. This tends to correct the effect of plain glass where the light adjacent to the window is too bright and where farther away it is insufficient for ordinary working purposes. Care must be taken in the selection of this diffusing glass to avoid that which will cause a glare and an objectionable effect upon the eyes of the workers. Some makes of this glass now available show almost twice as much illumination remote from the windows as plain glass. This type of glass is preferably placed in the upper window sash only, the lower sash being glazed with the ordinary type of glass. In any event, a row of clear glass at eye height is desirable to enable the employes occasionally to obtain a distant view in order to relieve eye strain.

Until recently it was not realized that the ordinary glass used for windows and skylights was not transmitting to the interior of the building all of the rays of the sun. Extensive experiments have now shown that the ultra-violet rays, which, although invisible to the eye, have a beneficial effect upon the health, are excluded by ordinary glass. Efforts have been made to remedy this deficiency in ordinary glass, and a number of manufacturers of window glass are now producing, under a trade name, a special product which has the characteristic of transmitting as much as from 40 to 50 per cent of the normal ultra-violet rays in ordinary sunlight. This glass is being produced in increasing quantities with a corresponding reduction in cost, so that at the present time it can be obtained at a cost for the material of only from four to five times that of the ordinary window glass. It is slightly more transparent than ordinary glass. Use of ultra-violet rays glass was at first restricted largely to the sun parlors of hospitals, sanitariums, and similar buildings, but more recently it has been introduced into commercial and industrial structures, a notable instance being that of the new plant of the Watson Stabilator Company of Philadelphia. Another type of glass, as well as preventing the entrance of the heat rays of the sun, prevents the injurious effect of the actinic rays upon certain classes of colored materials and eliminates eye strain due to glare.

Owing to the glare and heat of the sun's rays, it is frequently necessary to provide some form of protection for windows exposed to the direct rays of the sun in the morning or afternoon. One of the most inexpensive types of shades for providing ventilation consists of a series of wood or fiber strips fastened together at intervals and raised or lowered by means of cords, the shade rolling at the bottom as it ascends. Another type, somewhat more expensive, provides for greater flexibility of the light and air and is a modification of the Venetian type of blinds, which can be arranged to direct the light upward toward the ceiling, preventing glare and at the same time providing ventilation. One method of providing against the discomfort from the direct rays of the sun is to use a semi-transparent paint applied to the surface of the windows, usually of a bluish tinge. This has the effect of preventing glare and also of preventing the entrance of the heat rays of the sun, thus to some extent reducing the heat in the interior without unduly diminishing the amount of light.

An important adjunct to the proper illumination of a building, whether by daylight or artificial light is the proper painting of the walls and ceilings. Numerous paints are available for this purpose, it being chiefly important that the paint be of light color to reflect rather than absorb light, and that it will adhere and not change color after application.

From this it will be evident that methods and materials of construction are available for solving practically all the problems in the bringing of daylight illumination inside the building. There will, however, always be the necessity for services of skilled architects and engineers in the study of any given building problem to insure the application best suited in that particular case.



Interior of Modern Radio Manufactory of Atwater Kent Manufacturing Company, Using Super-span Sawtooth Skylight Showing Reflecting Value of Light Colored Roofing Material on Slope of Adjoining Sawtooth

The Ballinger Company, Architects and Engineers

ARTIFICIAL ILLUMINATION OF INDUSTRIAL PLANTS

BY

A. L. POWELL

ELECTRICAL ENGINEER

WHEN one pauses to view the advance of civilization, one is greatly impressed to find how inter-related and inter-dependent are the various elements which combine to produce a given result,—how one great advance hinges on development in some other field of activity, and how man or nature seems to rise to the occasion and provide what is necessary for outstanding economic changes.

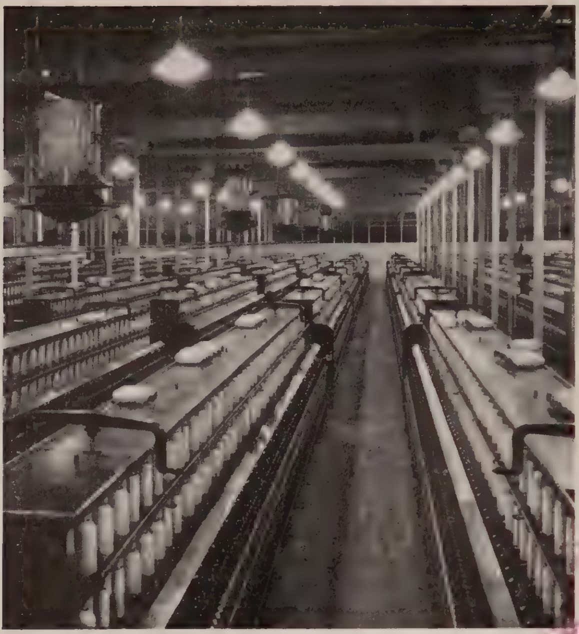
If an economical, reliable, convenient and powerful source of artificial light were lacking, work at full efficiency would be possible only in the hours of sunshine, and all machinery would have to be placed so that it would receive daylight. Fifty years ago there were available to light the industrial plants only weak, flickering candles, oil lamps and gas burners, and if these only were available today we would not be living in the industrial age. There can be no doubt that the introduction and rapid development of electric lighting is one of the very foundation stones of this twentieth century progress. Space does not permit a discussion of the fact that proper lighting does increase production, reduce shrinkage, promote safety and health, and keep the worker in a cheerful, contented frame of mind.

In brief, the industrial plant should be illuminated throughout to such a level that the worker can see the necessary detail quickly, without overtaxing the eyes. There must be no violent contrasts in brightness, no bright light sources in the field of view, and no glaring, annoying reflections from polished objects. One of the most important questions is,—what constitutes the right amount of illumination? A study of the functioning of the eye with increasing illumination shows a rapid improvement in visual acuity in the lower range of foot-candle values, and a much lower rate at higher levels. It must be borne in mind that such tests are generally based on the observation of black objects on white backgrounds, and in the industrial plant it is rare that these conditions prevail. Generally, the things to be seen are of varying shades of gray, with much less contrast, so that the standard visual acuity curves are much higher on the scale. Investigators do not really know where the upper limit lies. Plants which a few years ago were content with an illumination of 5 foot-candles have gone through the stages of providing 10, 15 and 20 foot-candles, and the most progressive are now demanding even more light for truly efficient operation. We cannot determine just how much light to supply in industrial plants from purely theoretical considerations, since tests of actual installations show that increased output is obtained as more light is supplied. There seem to be several features which have not yet been fully analyzed.

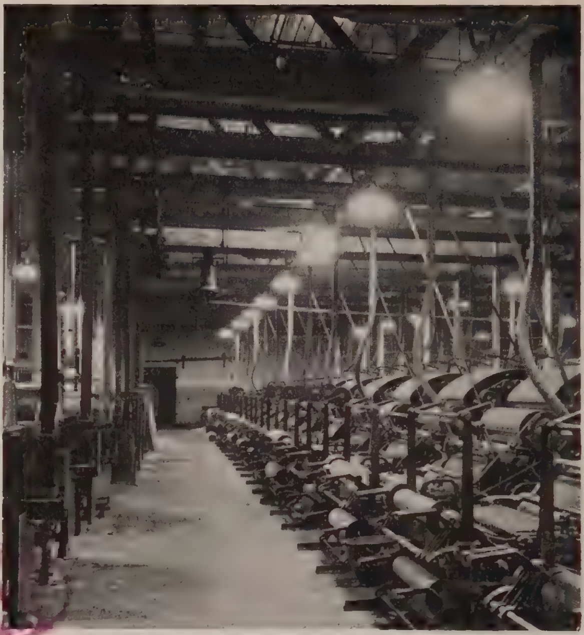
As we supply more and more foot-candles, other complications are introduced. The higher wattage lamps required are considerably brighter than those previously used. Additional precautions must be taken, therefore, to diffuse the light and reduce contrasts. With the present conditions as to ceiling heights and factory arrangement, using the commercial types of reflecting and diffusing devices, the limit of thoroughly

Machine Shop. Medium fine work. 500-watt white bowl lamps, dome reflectors. Outlets spaced 18 x 18′. Lamps 23′ above floor. Ceiling 25′. Ceiling white, walls glass. Illumination level 20 foot-candles.
Goss & DeLieuw Machine Company, New Britain, Conn.

Hardware manufacturing. Blanking punch presses. 150-watt white bowl lamp, dome reflector. Outlets 10 x 10′. Lamps 8′ 6″ above floor. Ceiling 10′. Walls and ceiling white. Illumination level 12 foot-candles.
Russell & Erwin Co., New Britain, Conn.



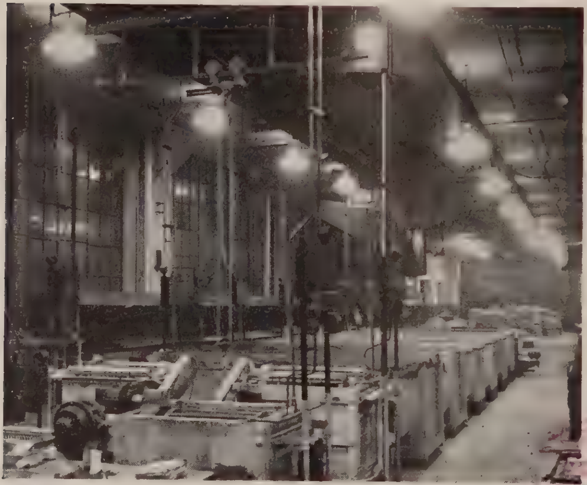
Textile mill. Spinning. 300-watt clear lamps, diffusing globes. Outlets spaced 14 x 21′. Lamps 12′ above floor, ceiling 14′. Ceiling white, walls principally glass. Illumination level 8-foot candles.
Chicopee Mills, Chicopee, Ga.



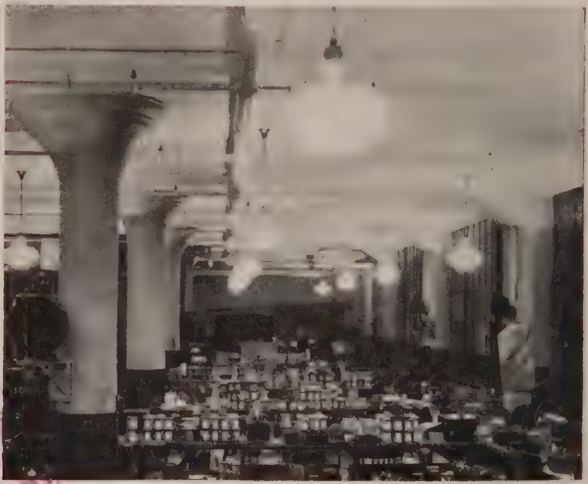
Textile mill. Rough fiber carding. 200-watt white bowl lamps, dome reflectors. Outlets 16 x 15′. Lamps 14′ above floor. Roof trusses 16′. Ceiling white, side walls white and glass. Illumination level 10 foot-candles.
Valway Mills, La Grange, Ga.

comfortable general artificial illumination seems to be in the neighborhood of 50 foot-candles. As we go above this value the installation is likely to become so glaring that many of the good effects of the higher level illumination are nullified. There is no doubt that when the demand for more artificial light is very general, the ingenuity of the scientist and engineer will come to the fore and will devise adequate ways and means of meeting the situation in all respects.

Common sense dictates the installation of a moderate level of general illumination (10 to 20 foot-candles) throughout the plant, supplied by uniformly spaced overhead units which are equipped to properly diffuse and distribute the light. This should be supplemented by peaks of high level illumination (100 foot-candles and upwards) at working points where fine detail is to be observed. There are many forms of reflectors for general illumination. The types most applicable to the industrial plant are: A standard dome reflector with bowl white lamp.



Electrical manufacturing. Electro-plating department. 300-watt clear lamps, diffuser. Outlets 12 x 12′. Lamps 15′ above floor. Ceiling 18′. Ceiling white. Walls glass. Illumination level 12 foot-candles.
General Electric Company, West Philadelphia Works.



Instrument manufactory. Coil winding. 500-watt clear lamps. Luminous bowl, indirect lighting fixtures. Outlets 9 x 17′. Lamps 9′ above floor. Ceiling 12′. Ceiling white. Walls glass. Illumination level 20 foot-candles.
Leeds & Northrup Co., Philadelphia

Meat packing plant. Cold storage and sales room. 60-watt lamps, shallow dome, porcelain enamel reflectors. Outlets spaced 4′ 6″ x 8′. Lamps 12′ above floor. Ceiling 13′. Ceiling white, walls white. Illumination level 12 foot-candles. Cudahy Packing Co., Norfolk, Va.

Flag manufacturing. General lighting 500-watt white bowl lamps, dome reflector. Outlets 20 x 20′. Lamps 13′ 6″ above floor. Ceiling 14′. Ceiling, walls white; illumination level 10 foot-candles. Local lighting 15-watt lamps. Annin & Company, Verona, N. J.

Diffuser with clear lamp.

Prismatic glass bowl-shaped reflector with clear or white bowl lamp.

Mirrored glass bowl reflector, clear lamp.

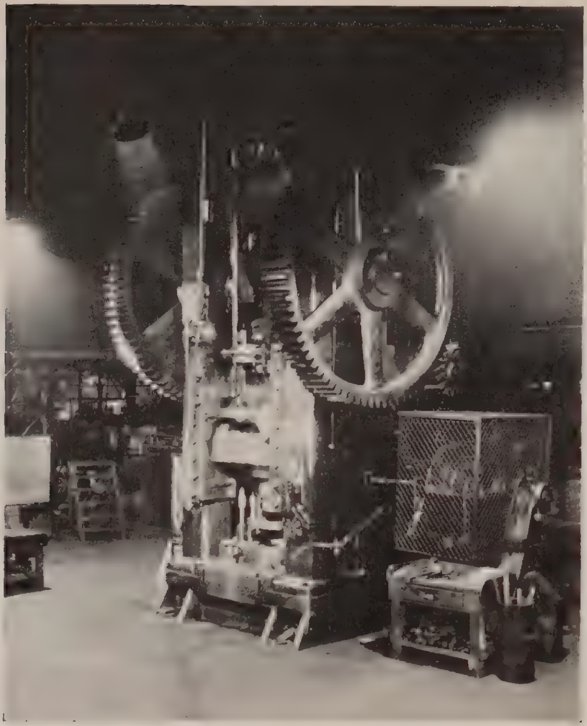
White glass enclosing unit, semi-indirect and totally indirect equipments are also applicable to factory use provided the surroundings have good reflective properties.

A discussion of the characteristics of the different forms of equipment, their efficiencies, their effect on the appearance of the lighted room, their method of preventing direct and reflected glare, type of shadows produced, and the ease of maintenance, would require several of these pages. All these factors should be given consideration in making a selection, and the handbooks on lighting practice present careful analyses of the relative merits.

In designing a building one is frequently unaware of the future requirements for lighting. A structure may be planned to be a storehouse, and a few years later changed conditions may

Silk mill. Weaving. 200-watt lamps, prismatic bowl reflectors. Outlets 6′ centers in weaver's alley, 12′ centers in rear alley. Lamps 9′ above floor. Ceiling 13′, ceiling white, walls white. Illumination level on work 25 foot-candles; on back of looms 6 foot-candles. Arohnson Silk Mill, Coatesville, Pa.

Color printing. Press room. General illumination. 300-watt clear lamps, diffuser. Spacing 12 x 12′. Lamps 12′ above floor. Ceiling 14′. Illumination level 18 foot-candles. Projector type equipment with 200-watt daylight lamps. Color identification unit at inspection table. Waverly Press, Baltimore



Close-up view showing the application of a projector type unit (or intensifier) for giving high level local lighting at a 1200-ton straight side power press. Federal Pressed Steel Co., Milwaukee

cause it to be used for manufacturing processes. It is much more expensive to re-wire a building than to install adequate wiring when it is being constructed. Not knowing definitely the future of a structure, the architect or designing engineer should provide an adequate number of overhead outlets, plus a sufficient number of circuits with wire of suitable size to take care of normal demands for lighting. If a given area is used as a storage space or for rough work, 100-watt lamps on each outlet may be adequate, whereas, if fine machine work is carried on, 300- or even 500-watt lamps may be necessary. A reasonably safe general rule to follow is to space outlets no farther apart than the height of the ceiling. Thus in a normal loft building with 10- to 15-foot ceilings, there should be four outlets in each typical bay. With the advancing standards of illumination, inadequate wiring is being found more and more often to be an obstacle toward providing the lighting which industrialists need and desire. In some instances the cost of re-wiring puts a serious burden on a projected improvement. In others, the voltage drop in the existing wiring not only causes an expensive waste of energy and poor regulation but actually reduces the illumination below the expected level. This situation is so serious to the users of light that the National Electric Light Association, through its Commercial and Industrial Lighting Committee, has undertaken activities to call attention to the importance of this matter and aid the lighting service engineers of its central stations in assisting architects and others in the specification of such wiring as will meet the probable requirements of the near future. A committee of experienced illuminating electrical engineers has prepared specification paragraphs covering the quantity elements.

The specifications are based on the use of 15-ampere fusing on branch circuits and, to quote, it is suggested that: "In no case shall one branch circuit for overhead lighting supply the lighting for a work space or rentable area greater than 400 square feet or a bay approximately 20 x 20 feet, or shall one branch circuit for overhead lighting supply more than 800 square feet of hall or passageway or other non-rentable or non-productive area. Based on the wattage of outlets specified on the plans, branch circuits shall be so arranged that the load on a circuit shall in no case exceed 1,000 watts, except in a case of a single lamp of larger size."

In these paragraphs the size of wire is specified with respect to the length of run by two sizes, namely, Nos. 10 and 12, B. & S. being recommended. Other features treated are panel boards and feeders. This method of specification conforms to ordinary wiring practice except that a higher standard is called for. It has the further advantage of clearness and definiteness, which enables a non-technical man to check compliance accurately. The wiring specified in this manner will carry the next larger size of incandescent lamp without excessive lowering of voltage. This feature, while relatively inexpensive, is likely to result in large future economies for the owner and user. If adequate wiring and a reasonable number of outlets are installed, the problem of correct lighting is quite simple. The owner or lessor can install the coördinated size of lamp and reflector to meet his special requirements.

The accompanying illustrations are from night photographs of installations which are considered as representative of good practice today. In the captions are presented reasonably complete details, so that each illustration really represents the solution of a typical lighting problem.

HEATING AND VENTILATING OF INDUSTRIAL BUILDINGS

BY

WALTER E. HEIBEL

OF VOORHEES, GMELIN & WALKER, ARCHITECTS

IN the early days of the factory system, chief importance was attached to the *quantity* of output, and little attention was paid to the employes' comfort or to the *quality* of the product. But as time passed a comfortable working space was soon recognized as being essential, and the proper heating of industrial plants became more and more standard practice. Today the heating system is always considered along with the design of an industrial building from its very inception. The large number of concerns now manufacturing factory heating equipment bears witness to the universally high standards found in heating systems. Ventilation and air conditioning are likewise of prime importance and should receive the same care and foresight as the heating work, but due to the highly specialized nature of the control of humidity, etc., this problem is usually left to the specialist for solution.

For the average industrial building the owner has the choice of any one of three types of heating systems. Broadly, they can be classed as: (1) fan system; (2) direct steam; (3) direct hot water. The fan system has been placed at the head of the group for the reason that experience has shown this type to be well adapted to the average manufacturing plant. Under the classification of fan systems there are two different types to consider: (A) the unit heater system of heating, and (B) the central system of heating.

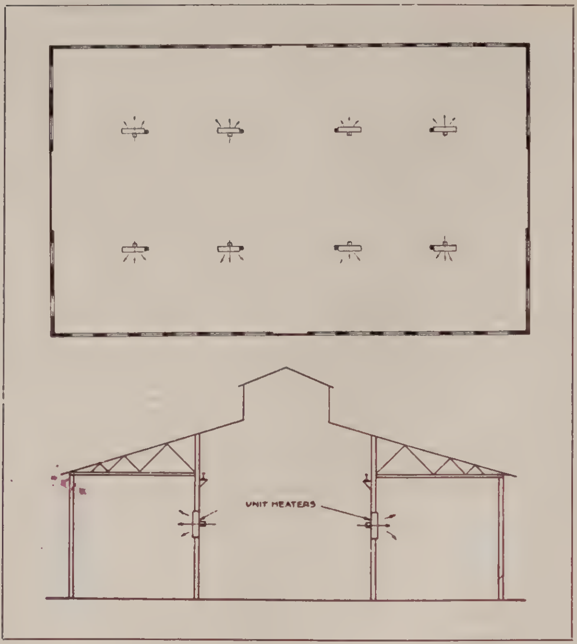
With the unit heater system the space to be heated is equipped with one or more units, each consisting of a fan and heater. Refinements have been added to some makes of equipment in the form of air filters and humidifiers, but the units which meet the demand of average service need only a heating element and a fan for distributing the heated air. This equipment is designed either as wall-mounted or floor-mounted units. Various sizes are available, so that almost any combination of space and other conditions can be met by standard equipment. In the floor type of unit the capacities range from about 3,000 c.f.m. to about 10,000 c.f.m. of air delivery. Standard wall-hung units generally run smaller in size and air delivery. It is the practice of manufacturers to give their equipment a catalog rating in B.t.u.'s per hour or equivalent surface for direct radiation in order to facilitate the choosing of the proper sizes.

The customary method for figuring the B.t.u. loss from a building is followed, and from this value the size and number of units for the building can be determined. By dividing the total heat loss by 240, the equivalent square feet of heating surface can be determined. Special units are obtainable to meet unusual demands, and in such instances, it is best practice to design heater and fan for the requirements.

The proper air heater may be chosen from the published data of any of the air heater manufacturers. In making this choice the air heater must be sufficient to heat the air from its temperature entering the heater to the temperature of the heated space plus the degrees of diffusion (H-h), where H=temperature of air leaving unit heater; h=room temperature. When air is re-circulated, the heater must then theoretically supply only the heat of diffusion, representing as it does the transmission losses. The fan may be chosen from the catalog data of any reliable fan manufacturer, giving volume, horse power, etc.

For the ordinary heating project it is satisfactory to figure that all air is re-circulated. The only factor involved which would demand outdoor air being admitted is that of ventilation, and ventilation requirements in factories are usually met satisfactorily by the ordinary leakage through windows and doors. Where the occupancy is highly concentrated, or where processes employed demand it, forced supplying of fresh air is effected by means of connections, directly through the building walls in convenient locations, or by utilization of a portion of the window openings. It is desirable in any event to provide dampers in order that the quantities of fresh air and re-circulated air can be controlled. Floor type units are preferable for the average industrial plant for the reason that they can be obtained in larger sizes, thus requiring fewer units, less piping and lower maintenance cost. As a practical consideration, use of any equipment which can rest on a solid floor generally simplifies the installation work. Floor space is seldom so valuable that a few square feet cannot be allotted to the heating equipment.

Heat distribution can be effected easily by maintaining high outlet velocities from the heater openings and thus create a general motion of the air in the heated space. This general air movement is highly desirable for its effect upon the employes' comfort, providing that a direct blast of air upon any one is avoided. Very satisfactory results also are being obtained by



A Good Arrangement of Wall Type Unit Heaters for Satisfactory Heat Distribution

the smaller units which lend themselves well to suspension from walls, girders, or other parts of the building structure. These units are of very simple construction, usually with the heater and propeller type fan-mounted in a sheet metal casing, and with the fan wheel mounted directly on the shaft of a small fractional horse power motor. These units are used to considerable advantage in augmenting the heating effect of other forms of systems, for warming cold spots which occur near large doors, the opening of which is necessary for the passage of material.

In the cheaper grade of buildings, the direct-fired unit heater has found some favor. With this equipment fuel is burned directly in the unit and the heat transfer is made directly from the hot flue gases to the air which is being circulated by the fan through properly designed air passages. There are many obvious objections to any form of direct-fired heater, among which are the fire hazard involved, the easy access and resultant tampering by unskilled operators, the untidiness which generally surrounds a furnace regardless of what fuel is used, and the high maintenance and operating costs.

Central Heating. For a great many years, before the advent of unit heaters, the principal source of heating in industrial buildings was the central heating plant with a system of distributing ducts for conveying the heated air to the various parts of the building, running through the structure overhead, or in trenches underground. This system generally averages higher in cost than the unit system, but it shows some economies in operation and maintenance. Where careful control of atmospheric conditions is necessary, or where special ventilation is desirable, this system is preferred. In such buildings as lithographic plants, hat factories, textile mills, and manufacturing plants for candies and food products, temperature, humidity and air movement are all important and can be maintained with remarkable accuracy by means of a central heating plant with control equipment.

The central heating plant consists essentially of an air heater and a system of distributing ducts. To this is added an air filter, if cleanliness in the building is important. The design of the system provides openings and dampers for re-circulation of the major portion of the air, and in very large plants, or where the heating plant is isolated from the heated space, ducts for returning air to the heating plant are installed. Distributing ducts are attached to the heating equipment for conveying the air to the various parts of the building. These ducts are usually installed overhead in the roof trusses

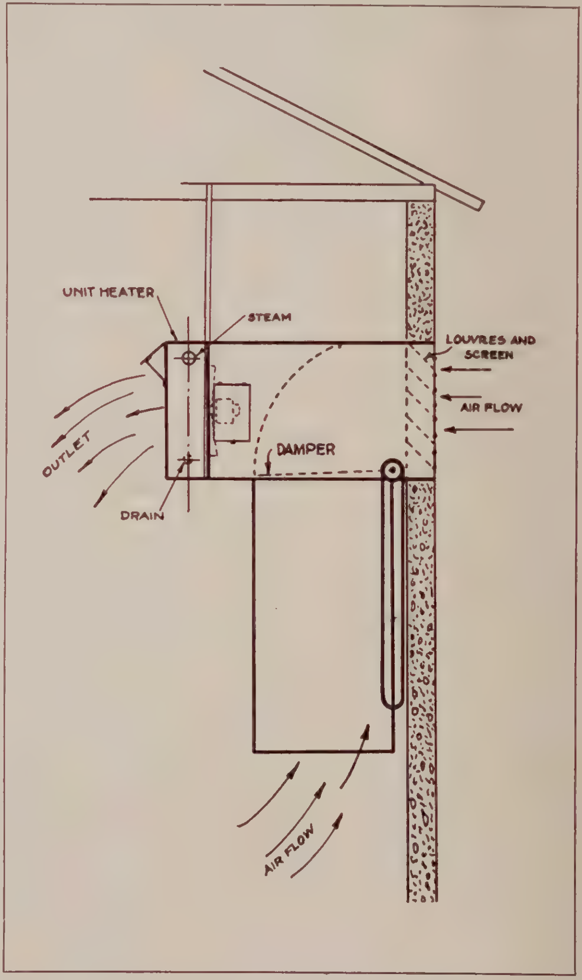


Diagram Showing Air Flow in Unit Heater Equipped with Damper for Re-circulation

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Floor Mounted Heaters in an Industrial Building

or along the ceiling, but convenience occasionally requires that they be placed underground. The velocities maintained throughout the ducts are relatively low in order that the frictional resistance against which the fan must operate will be low enough to prevent excessive horse power requirements for the fan. With large installations, duct velocities of 2,500 feet per minute to 3,000 feet per minute at the fan outlet are usual, with a gradual lowering of velocity to about 800 feet at the last outlet; but with smaller duct systems, or where preventing noise is an element, 2,000 feet per minute velocity should not be exceeded. In some manufacturing plants, both supply and exhaust fans are employed. With such systems, the outlet of the exhaust fan is connected to outdoors through an exhaust hood and also connected through a duct with the intake side of the supply fan for re-circulating a portion of the exhaust air.

The design of the duct system should be made only after a careful study of the building and equipment plans. A carelessly designed duct system usually results in there being made a series of subsequent changes which may materially alter the original intent and purpose of the system, or involve a series of price "extras."

The location of ducts should be such that the heated air from the supply outlets may blow toward the outer walls as well as toward the center where it can overcome most effectively the heat losses from the building. The design of the ducts and distribution outlets should be carefully considered to determine the best means of insuring suitable temperatures at the breathing line without overheating the upper part of the floor or building and thus cause an excessive heat loss through the roof. Frequently the upper section of a building is merely a storage space for unused heat, and only a well designed distributing system can place this heat in the zone where it will be of use to the occupants.

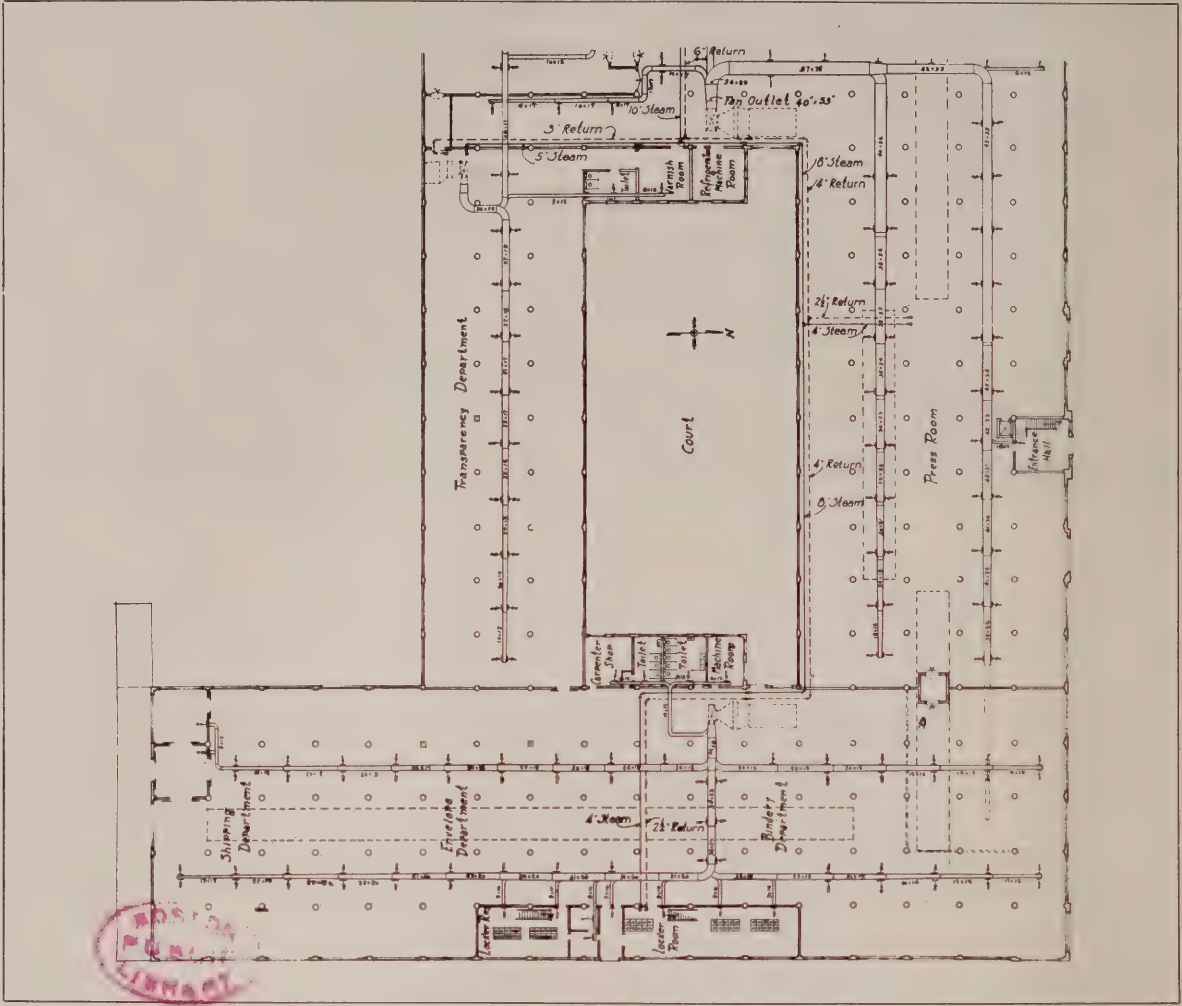
In calculating the size of equipment necessary, the procedure is first to calculate the total heat loss from the building; this loss includes the total B.t.u. per hour transmission plus window and door leakage. The next step is to determine the volume of air to be circulated from the formula:—

Cubic feet of air per minute $= \text{B.t.u.} \div [.2375 \times .074 \times 60 \times (H-h)]$ where:

H=Temperature of air leaving heater, minus duct loss;

h=Room temperature.

It is customary to design the heating systems for industrial plants to maintain a temperature in zero weather of 60° within the building. The loss of heat in the air passing through the ducts from the heater to the supply outlets in the building is generally represented by a temperature drop of 10 degrees. In choosing the air heater an actual velocity through the heater of from 1,000 feet per minute to 1,200 feet per minute should not be exceeded, and the heater should be ample in size to care for the heavy load imposed upon it during the warming up period. The operation of a fan system of heating is usually intermittent, for it has been found that with the exception of a few unusually cold and windy days, a few hours' operation per day is sufficient. Where variable speed is possible for the fan, economies can be effected by cutting down the flow of heated air after the building has been brought up to temperature. This is particularly true when the steam supplied to the air heaters is taken from a common supply for various purposes, and the operation of the boilers is continuous. Where the boiler load is purely



Duct and Equipment Layout for Air Supply and Distribution in the Plant of the American Lithographic Company, Buffalo

one of heating, the most economy can be obtained by completely closing down the heating system and banking the fires in the boilers.

Direct steam heating is very commonly used in buildings of any nature, and for industrial plants it is found most frequently in multiple-story buildings. Radiators of the wall type have been found preferable to pipe coils or column type of radiators for the reasons that they can easily be installed with the least infringement on floor space, and have a very good heat emission factor. Care should be used in installing radiators to keep them far enough from the walls to insure a good circulation of air between the radiators and the walls, and thus prevent an excessive heat loss through the walls. Trombone coils and header coils have been used extensively in the past, but are not found so frequently in modern installations. Difficulty in keeping any pipe coils tight and problems of drainage preclude their more general use. Steam is supplied to the radiators at low pressure (0 pound to 2 pounds), and the usual two-pipe system with vent and return traps through which return condensation passes to the boiler is generally used. A separate drip line is used where risers require it or where the mains are sufficiently large to make it desirable. In many buildings it is desirable to use a vacuum pump and receiver in place of the return and vent traps, and a vacuum is carried on the return mains which insures rapid circulation and positive return of the condensation.

Except in multi-story buildings, basements are rarely found in industrial structures. Therefore, in order to avoid using trenches, which are always undesirable, the customary method is to place the steam mains under the roof and feed the steam down to the radiators. The return mains are located beneath the radiators and graded back toward the boiler room. Supply valves of the packless type should be used on the radiators, and thermostatic traps should be installed on the return ends of all radiators and coils. Provision should be made for dripping the heat risers when radiators are shut off.

When possible, roofs should be insulated, for the loss of heat transmitted through the roof can be minimized to a degree that will easily offset the expense involved. On buildings having flat roofs, insulation is essential in order to obviate the necessity of installing an excessive amount of radiation on the floor directly beneath the roof. Roof insulation has the added advantage of keeping out excessive heat during the summer months. On buildings several stories in height, an upfeed system is preferable for the reason that the natural tendency for heat to rise makes the heating for the lower floors more difficult than for the upper floors, which, due to the flue effect, receive considerable warm air through stairways, shafts, etc. Air leakage is inward on the lower floors and outward on the upper floors. This condition, obviously, is modified by wind and exposure.

Vacuum Systems. Very recently, specially controlled vacuum systems have been developed for meeting the varying heating requirements within a building. A source of great heat waste has existed through overheating during the milder weather prevalent in the fall and early winter, and in the spring. With the ordinary vacuum system, steam at approximately the same temperature and amount continually fills the radiators. Since the radiation is calculated to provide the necessary temperatures in the most severe winter weather, generally assumed as zero, with a 15-mile per hour wind blowing, this same heating effect will be too much for the average day encountered during the heating season. Therefore, any equipment which will moderate the intensity of the heating effect of the radiators is highly desirable, and it is with this thought in view that certain manufacturers of heating specialties have developed the equipment just referred to. In one typical method of regulation the amount of steam fed to the radiators is controlled, and in another method the temperature of the steam is controlled by varying the absolute pressure at which steam is furnished the radiators. For instance, the temperature of steam at 2 pounds' gauge is about 216°, and at 18 inches of vacuum is approximately 177°. Such heat regulation should effect very great saving in fuel consumption when the operating engineer has knowledge and full understanding of its merits and limitations, and it should be considered in every installation where vapor systems are being planned.

Hot water heating for industrial plants in many ways is ideal for the reasons that temperature regulation is made simple by means of varying the water temperature, and convenience in piping can be arranged when forced circulation is used. In very large plants and groups of buildings, forced hot water heating has been, and still is, largely used, but the installation costs are greater than for other systems.

Exhaust steam is frequently available for heating industrial plants. It is usual to assume that the economies thus obtained are very great, but in practice it is rarely possible to use the exhaust steam to anywhere near its maximum effectiveness, unless the chain of circumstances surrounding its use is just right. For instance, the maximum demand on the heating system comes during the warming-up period, or before the plant assumes operation for the day. During this interval there is no exhaust steam available. When exhaust steam is available, later on, the demand for heating is so low that little steam is required. It is found to be very difficult to so regulate the heating requirements that they will fit the exhaust steam supply, and in order to utilize this steam to its fullest, additional control equipment is necessary and high maintenance cost is the result.

Air Conditioning. Any discussion of the control of the atmospheric conditions in an industrial plant should include air conditioning. Furthermore, this discussion should include a study of the effect of this control, not alone on the comfort of the employes, but on the product as well, for it is only by such means that good over-all efficiency can be obtained. The stepping up of production has made necessary new and better manufacturing machinery. Machines in the hands of skilled designers and builders have become more or less perfected. Competition in price and quality has demanded further improvement in production methods, and attention has been concentrated on the elements other than machines and operators which affect the product.

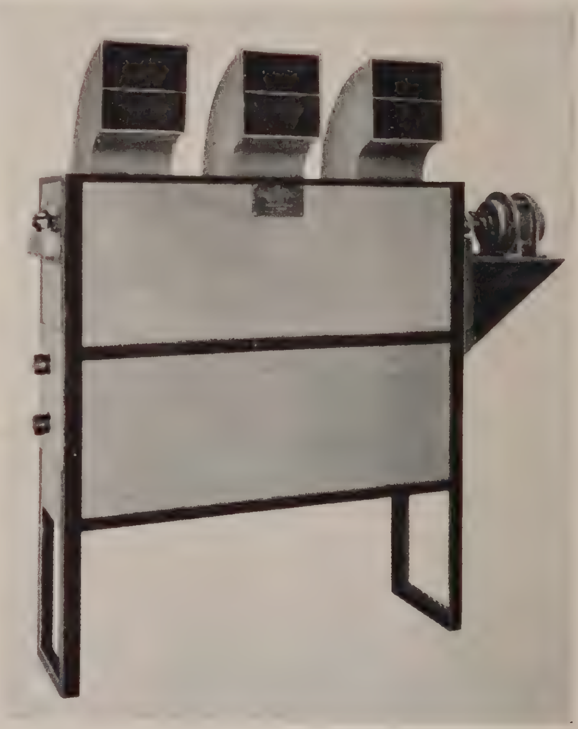
The general conception of air conditioning includes, in addition to temperature control, full control of humidity and air distribution. Where temperature control generally contemplates a heating of the air during the winter months, it necessitates a cooling of the air during the warm summer months. Absolute humidity, low during the winter months, requires an increase of moisture in heated spaces, and humidity, relatively high during the summer months, generally requires a decrease if air temperatures are lowered. Control of humidity and air movement as it affects the comfort and health of employes is equally desirable in all manufacturing establishments, where the occupancy is of any great density, but in textile mills, candy plants, bakeries, match factories, paper mills, and many other plants, such control is essential. The physical properties of many products are materially changed with changing moisture contents. Anyone observing the condition of a carding room in a textile mill after a period of shut down of humidifiers, and with heat still maintaining regular temperatures, can testify to the havoc that can be wrought with valuable materials.

The full air conditioning unit consists of a fan, heater, filter, humidifier (or de-humidifier), and the auxiliary equipment such as refrigerating machine, pumps, motors, control equipment, etc. The plant may be arranged as a single central system to provide air conditioning to the entire factory, or it may be arranged in multiple units, each complete in itself, and designed to provide control over a certain section of the building. Where varying conditions in the plant exist, or where rooms are partitioned off, the unit system is very desirable, but before either a central system or a unit system is decided upon, a very careful check of all fundamental data affecting the system should be made. In some processes, it is more convenient to segregate the humidifier from the other equipment and install humidifier heads in the building, or to provide humidity evaporating pans at convenient locations in the duct work.

Where humidity conditions require a lowering of the wet bulb temperature of the air below the dew point, refrigeration is necessary. In view of the great expense involved in the operation and maintenance of a refrigerating unit, it is essential to maintain as high a degree of temperature as possible, consistent with comfort and health and effect on the product, in order to keep the quantity of refrigeration used at a minimum. The heat-absorbing capacity of the refrigerating equipment must be sufficient to overcome all heat transmission and leakage quantities, in addition to the lowering of the temperatures of the incoming air with its resultant water vapor, condensate and latent heat of water vapor. This means that the temperature of the air must be cooled down a considerable amount below the final desired temperature, so that as the transmission and leakage gains are being met, the temperature of the air is being drawn closer and closer to the final room temperature mark. It is not uncommon to find cases where the transmission and leakage gains are insufficient to insure a proper final temperature and humidity in the building, and therefore a re-heater is always installed which provides any makeup heat that is necessary. A typical installation of air conditioning equipment is shown here, making clear the design of the fan, heater, humidifier and distributing ducts. This installation was made in a lithographing plant.

Automatic temperature control for the heating system in the average industrial plant is not essential, and it is rarely installed except where some processes make it desirable, or where fully automatic air conditioning plants are employed. Pneumatic systems of temperature control are most commonly used. For direct radiation systems there are types of electric thermostats and direct-acting valves which are sometimes used.

There are now on the market a number of direct-control valves for two-pipe direct heating systems, where this new device replaces the supply valve on each radiator. These valves are provided with a thermostatic element in the valve and depend in performance upon the circulation of air through them. Although these valves may properly be said to have passed the experimental stage, they are all too new to rely on as implicitly as would be the case had they a better background of use. A truly modulating valve has also been developed to accomplish some degree of heat regulation. This valve is more in the form of a supply radiator valve, but inwardly is so designed as to give minute throttling and steam distribution in the radiator. This valve, although depending entirely upon manual control, can become an element of no little heat saving with a little interest and experience on the part of the engineer. A key-operated valve is desirable in order to prevent any tampering with the engineer's adjustment by inexperienced men.



A Unit Heater Designed for Floor Mounting

PRACTICAL PLANNING FOR THE FACTORY CAFETERIA

BY

VINCENT R. BLISS

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IF, as is usually the case in modern industrial buildings, a cafeteria is to be included for the benefit of employes, this feature should be given careful and practical attention in the architectural plans, or its operation will suffer, and its outfitting cost will quite likely be affected as well. The actual planning of the food service facilities should, of course, be placed in the hands of trained kitchen engineers such as are connected with the leading outfitting concerns, but in order that they may have a satisfactory basis upon which to work, it is imperative that the size, character and location of the dining room and kitchen space should be determined in accordance with a few well defined principles.

Calculating the number of meals to be served is at best only an estimate in any individual case, so that general percentage figures are used only as a means of comparison. The proportion of employes who will be likely to patronize the cafeteria will depend upon: (a) the type of employes, particularly whether they as a class will be likely to eat in a restaurant at all; (b) the location of the plant with reference to the employes' homes; (c) the existence of outside restaurant facilities within reasonable distance; (d) the attractiveness of the cafeteria and of the food served. These factors should all be borne in mind when it is said that under reasonably favorable circumstances the average experience is that about 60 per cent patronize the cafeteria at the start, and that this may increase gradually to approximately 75 per cent within a year's time if the cafeteria operation is satisfactory. Thus, if a single lunch period is used, a plant with 300 employes would require a cafeteria of 200 or more seats. It might be mentioned that two lunch periods are frequently used, one reason for this being the desire to allow factory and office employes to use the cafeteria at different times. If this is done it will naturally reduce the number of seats in proportion to the total number of employes. Some excess capacity should really be figured upon to take care of future expansion.

Whether single, double or multiple cafeteria service counters should be used is a problem that will have to be solved by the kitchen engineer. Greater serving speed can be obtained in industrial cafeterias than in those catering to the public, due to there being a more limited menu. The maximum for a single counter is about 200 persons served in from 10 to 12 minutes, which is about as long as it is wise to make

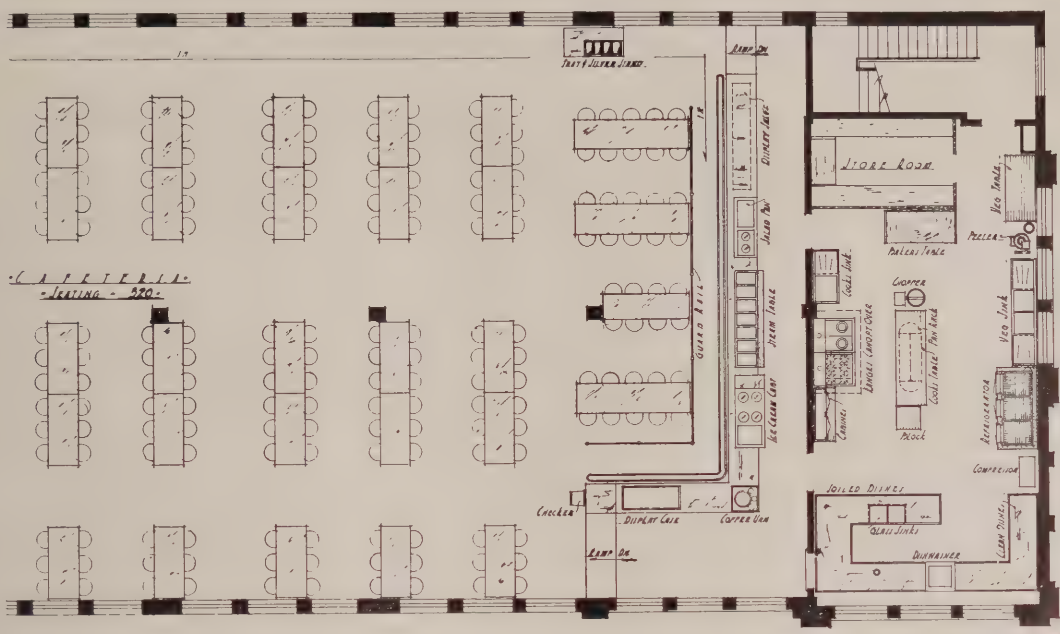
Cafeteria of the Edison Electrical Appliance Co., Chicago

Employes' Cafeteria, Illinois Steel Company, South Chicago

people stand in line. If more than 200 employes are to be fed, therefore, either two lunch periods or double service counters will be necessary. This question, and also the length of the counter, will have a bearing upon space requirements as well as upon room arrangement, and therefore should be settled as soon as possible.

Space Requirements. The accepted method of calculating space is to use an area per seat formula, yet this cannot be taken strictly at its face value, for it will be found that there are several variable factors among which the most important are: the type of seating arrangement (size of tables, amount of aisle space, etc.); the shape of the room, and the resulting amount of waste space; the type of counter layout (whether single, double, or multiple service); and the completeness of the kitchen facilities. Barring any abnormal amount of waste space, this rule may be accepted as a safe normal working formula: For cafeterias of medium size (120 seats and up) the area of the dining room, including the cafeteria counter, should be 15 square feet per seat. While there have been cafeterias in which this figure is reduced to as low as 12½ or 13 square feet per seat, this does not allow a comfortable amount of space at tables and makes it necessary to use large seating units which may be satisfactory for high school pupils, for instance, but which is undesirable for adults. In the interest of comfort and the elimination of crowding and confusion, therefore, it is wise to adhere to the 15 square feet per seat rule. The cafeteria kitchen should occupy a room from 25 to 33 1/3 per cent as large as the dining room and service area, adding about 5 square feet per seat and making a total for the kitchen and dining room of 20 square feet per seat.

On this basis a 200-seat cafeteria would need a total area of 4,000 square feet, of which 1,000 square feet would be occupied by the kitchen, 500 square feet for the serving counter, etc., and 2,500 square feet for the dining room proper. It should be mentioned that in a very small cafeteria the space per seat would have to be larger than the figures given here. For example, a 32-seat lunch room such as is used in some industrial buildings, notably in telephone exchanges, would need about 720 square feet of space or an area of 22½ square feet per seat. The minimum area for a kitchen, regardless of the size of the restaurant, is from 300 to 350 square feet.



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Plan of the Kitchen and a Portion of the Cafeteria of the American Can Co., Chicago

Location in the Building Plan. The first requirement is good light and air and pleasant surroundings, for the factory lunch room will be poorly patronized and thus fail to serve its purpose if these are not had. The second is to locate the cafeteria in such a way as to make it accessible to employes of all classes without making them travel unnecessary distances, and without causing confusion and congestion in corridors or other passageways. One of the best schemes has been to group all of the employe accommodations, such as washrooms, locker rooms, smoking or card rooms, etc., together with the cafeteria on the ground floor, close to the entrance of the building. This is logical and convenient in every way. It also agrees with the general advisability of placing the cafeteria near the building's entrance which, among other things, makes it accessible to the employes of neighboring plants, if such outside patronage should be desired. There is no objection from the standpoint of operation to an upper floor location for the cafeteria, although if this is done the matter of incoming supplies, garbage disposal, etc., needs rather careful attention and requires easy access to a good sized service elevator located within convenient reach of the service entrance to the building.

It is of the greatest importance to locate the kitchen immediately adjacent to the cafeteria, for otherwise its smooth operation will be severely impaired. The best practice is to have the kitchen extend along one side of the cafeteria room, with the serving counter directly in front of it and with suitable openings or passages between the two for bringing replenishments to the counter. Where absolutely necessary, the kitchen may be located on the floor below, but this requires unusual precautions in order to make service practical, and it usually involves expense of installing dumbwaiters or conveyors.

Room Arrangement. The dining room itself should be rectangular, and while not necessarily square, it should not be more than about two times as long as wide. Irregularities in the shape of the room should be avoided as far as possible, especially if they interfere with the use of a straight counter, for although L- and U-shaped counters are practical, they are more expensive to build than straight counters. The ideal kitchen also is rectangular and about one and one half times as long as it is wide. In very small restaurants the kitchen, cafeteria counter and tables are all installed in one open room, but this is not desirable, for it is almost impossible, under these circumstances, to handle the ventilating problem, to say nothing of the unsightliness which results. Large size cafeteria kitchens often should be divided into two or more rooms in order to segregate the store room,

Employes' Cafeteria in the Montgomery Ward & Co. Building, Fort Worth

dishwashing department or other subdivisions from the main kitchen. Whether or not this is likely to be necessary will develop as the actual equipment engineering plans are being prepared.

Auxiliary Requirements. Adequate provision for hot and cold water, steam, gas, power, sanitation, drainage and ventilation unfortunately cannot be handled by means of any known set of general formulæ,—and yet, unless they are handled with accuracy, they are likely to prove troublesome. For this reason it will be advisable to call in the cafeteria specialist at as early a time as possible in order that all such technical matters may be settled before the building plans have progressed far enough to allow any complications to arise.

Counter Construction. Cafeteria counters should be built of metal; wooden counters are unsanitary and impractical. Inexpensive metal counters have an angle iron framework with galvanized steel panels which may be suitably painted, while better grades have porcelain enameled steel, glass, or Monel metal panels. While glass counter tops are popular, the present trend is toward the use of polished Monel metal, as this eliminates breakage and is equally sanitary. Table tops of linoleum, rubber tile, composition or ¾-inch glass are all satisfactory, but wood is not. There is a type of table especially designed for industrial use which has a pipe-leg base with stools attached, and this has practical points in its favor, although it is not very likely to appeal to high class employes.

Specifications and Bids. It is well to offer a word of caution about cafeteria equipment specifications. When one manufacturer bids on another's specifications, he is really figuring his method of construction against the original, and there is frequently a world of difference between the two. This may be unavoidable, but its danger will be minimized if the architect will insist upon very explicit specifications in the first place, and upon an equally clear definition of variations in either construction or materials from additional bidders. Especial attention should be paid to the kinds and gauges of metal used, as this is one of the most common points of variation. The lack of standardization among equipment manufacturers makes these precautions essential if the contract is to be awarded on a fair basis.

PLUMBING AND SANITATION OF INDUSTRIAL BUILDINGS

BY

A. R. McGONEGAL
SANITARY ENGINEER

DESIGNING the plumbing equipment for factories, mills, warehouses and industrial buildings and plants or groups of buildings requires almost as varied treatments as there are purposes for which the plants are built. This variation persists in every study made. Not only does the proportionate number of fixtures vary, but the type as well; and the materials to be used, both rough and finishing, must be made applicable to the particular use. In hotels, apartments, office buildings, schools and similar structures, there is a known ratio of the number of fixtures per room, per unit of area or space, or other fixed measurement; and even the types of fixtures are of well recognized standards, whereas every industrial building or plant seems to present a different basis of design.

Modern warehouses have great floor areas and have few employes to be provided for. Steel works, shipyards, car and locomotive shops, potteries, paper mills, and similar plants cover large areas, frequently with many buildings, and have but few more employes per unit of area than the warehouse, though they are widely scattered and the several groups of employes are "settled" in their particular parts of the plant, instead of laboring in one section for a time and then moving to another as in warehousing. On the other hand, clothing factories are heavily peopled per unit of area.

Fixture Ratio. In industrial work the ratio of fixtures must be based on the number of employes, but in the case of few employes and large areas this ratio should be modified by the time factor. While it is true that in modern manufacturing practice, piece work is the rule and time out is the employes' time, still it is poor organization practice to require an employe to go great distances for toilet purposes, and in group assembly work it is out of the question.

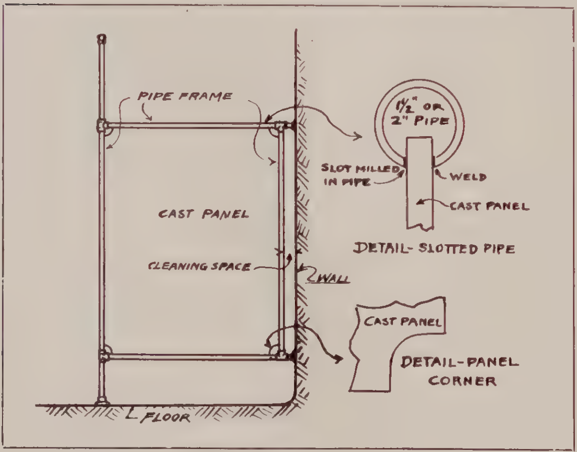
The toilet fixture ratio established in the factory laws of many states,—one water closet to each 15 employes,—appears to be well justified in practice if modified by the individual conditions presented. For instance, in small plants the ratio might better be 1 to 12. Two urinal fixtures are generally accepted in lieu of one water closet, provided half the legal number of water closets are furnished and urinals substituted for the others. The proper installation and economical maintenance of plumbing fixture equipment require that fixtures shall be grouped and not scattered, and while nothing is gained by having more fixtures than are necessary for the number of people to be served, a toilet room containing fewer than six water closets and eight or ten urinal fixtures will be generally found unsatisfactory. It is good practice, too, to figure one more closet and one or two more urinals in each toilet room than the numerical ratio indicates, to take care of fixtures out of use, unusual demand, and similar conditions. Sometimes an extra closet enclosure is provided with a lock for the foremen, but it is generally considered better to provide a separate private room for them. Small wash sinks or lavatories should be in each toilet room for reasons of personal cleanliness, these being in addition to the regular wash-up facilities provided elsewhere. Bearing in mind that employes should not be required to go long distances, clothing factories and similar well peopled factories in loft buildings should have at least one room for each sex (if both are employed) on each floor, and if the number of employes exceeds 200, two toilet rooms are better. In specially built factories of the long and narrow type two toilet rooms staggered on opposite sides, each one quarter the way from the end, will be good design. In steel mills or in other places where men are more scattered, separate toilet buildings are to be preferred; perhaps one to each fairly large building or group of small structures will be found best, but the time element should be considered. The writer has seen single industrial buildings of such length as to justify two or even three toilet locations.

Wall, Floor and Partition Materials. Naturally, in industrial work, great care should be taken in wall, floor and partition work to make it of the most substantial and lasting character, and of materials easily cleaned and kept clean. It is a demonstrated fact that employes will not have the urge to disfigure or damage fixtures or fittings in a substantial, well lighted, and well kept toilet room. Sunlight is not only one of the chief germicidal agents but is a cleanliness aid without peer. Every toilet room should have more than ample window area opening out into a space open from ground to sky and far enough removed from any walls or buildings opposite to assure direct sunlight to all the windows for half the day.

In selecting material for wall and floor finish, it is proper to couple reasonable cost with desirable qualities. Perhaps the most satisfactory floor surface will be one of the several bituminous mastic floors laid as a unit on a concrete subfloor. They are not unduly expensive, are water- and vermin-proof, wear well, and if need be they can be "ironed over" or can be taken up, remixed and relaid.

For wall work the writer has never seen any material lending itself to this purpose better than the mottled salt glazed hard burned brick to be had in any locality. It can be had in a very light tan, and if laid in a fat cement mortar with thin tooled joints it presents a scratch-proof, pencil-proof, and practically non-absorbent surface. It can be carried to a height of 8 or 9 feet and the upper walls and ceiling finished in white hard plaster for light-reflecting purposes. These bricks can be had with coved bases and rounded for room corners so as to eliminate dirt-retaining angles, and the plastered ceiling can also be rounded to the walls.

The selection of partition materials offers a wide range of choice, but when finished the partition should be very strong, and easily kept clean. All fastenings to wall or floor should be made with heavy toggle, lag or through bolts, exposed faces flush where possible, and concealed nuts upset. If partition work is of metal, welding or brazing should be the rule. In selecting metal partitions of commercial units, they should be judged on their strength, rugged construction and durability because of the rough usage they must stand in industrial plants. A satisfactory closet partition can be made up with a 2-inch steel or iron pipe frame, the pipes slotted to receive a cast or rolled sheet ⅜, ½ or even ¾ inch thick. A rough surface cast panel possesses the advantage of discouraging attempts to write on it, and it is practically unbreakable. The pipe at the front of the frame should be carried up above the partition panel and be connected across the fronts by a transverse pipe high enough to discourage attempts to swing on it. The pipe at the back of the frame should be supported 2 inches away from the wall, leaving the wall surface free for cleaning. The fittings with which the pipe frame is put together should be welded or brazed, if indeed the whole pipe frame for the partition work is not welded without fittings. For finish, plain lead and oil in a neutral gray will be found satisfactory. If the partitions extend out far enough to constitute an acceptable screen, there is little need for doors to the closet enclosures, and it is no longer considered necessary or advisable to provide them.

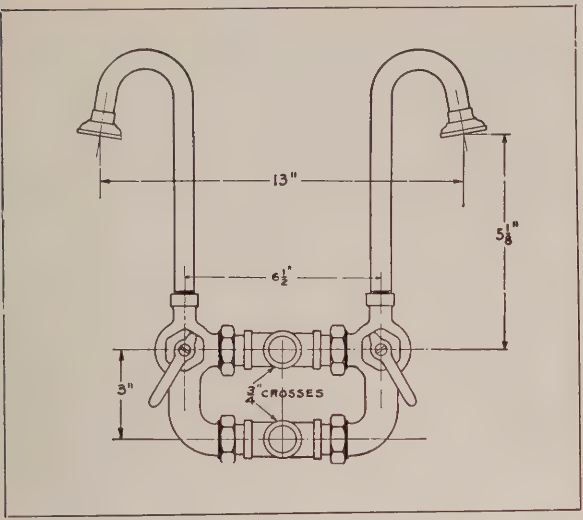


Details of a Pipe and Panel Closet Partition

Locker and wash-up rooms have a decided advantage over groups of lockers scattered throughout the plant. It is not so necessary that these facilities be within easy distance of the places of employment, and consequently they can be constructed in larger units. It is not considered good policy to have the lockers in toilet rooms because of odors, the greater moisture content of the air near more or less constantly running water, and other reasons; but it is good practice to have them adjacent to toilet rooms or buildings. Wash-up sinks are in general use at quitting time only, and may well be located in locker rooms if the plan is such as to make such construction desirable.

Lockers are of two general classes,—those with wire mesh or expanded metal fronts which ventilate into the room, and those with closed fronts and ventilated by duct and fan. If ventilated by fan, the air intake should be from the outside or else protected against dust. Many installations are supported from walls or on stands 8 to 12 inches from the floor to permit cleaning under, and the tops should be so sloped as to prevent dust collection or the lodgment of papers or cast-off clothing thrown there. Unit steel lockers come in a wide variety of stock styles and sizes. Double-tier lockers are extensively used, but wider units are necessary than for the single tier, and in cold climates the short locker is hardly suitable for heavy outer garments. A narrower long locker is more satisfactory to the user and makes for contentment of the employe. Locker keys cause endless trouble through loss of keys, leaving keys at home, and wear. Three-number combination knob locks will give an almost endless variation of settings, can be had with almost any make of locker, and will generally be more satisfactory than the keyed locks.

Wash-up sinks can be had in a great variety of styles and in several materials. Slate, soapstone, an especially treated cement, glazed earthenware, and enameled iron are offered by several manufacturers, and they may be had in long, narrow, single or double patterns, individual type lavatories, large circular basins accommodating several around the rim, or long trough-like sinks with individual tipping basins. The class of users, the space available, the shape of



Wash-up Fixtures for Exposed Supply Pipes and Double Sink

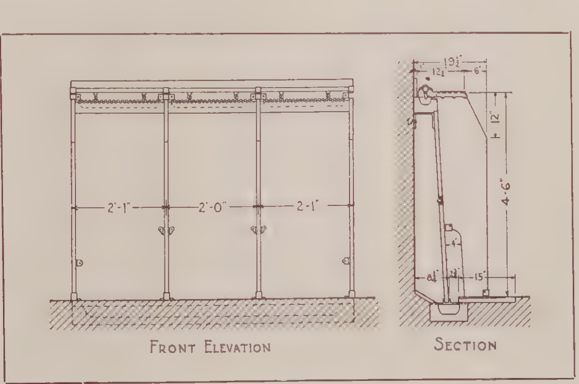
Lockers with Wash-up Sinks Between Centrally Located Drinking Fountain

room and other considerations generally dictate the selection of the particular type and material. If the designer is intent on permanency, perhaps it is better to build the wash-up sinks to fit the requirements. An alloy of metals can be used to form up a wash-up sink to fit any specified conditions. There are a number of instances in industrial plumbing where "Monel" metal wash sinks have been given hard usage over a long period of years and are still intact and untarnished, special handwashing compounds and mechanics' soap notwithstanding. Monel metal is a natural alloy of copper with a high nickel content.

The use of a gooseneck spray supply fixture for wash-up sinks is practically universal. This fixture mixes hot and cold water through a single column in much the same manner as a shower bath fixture; indeed it is identical in design and operation, but on a smaller scale. The usual equipment has hot and cold faucets so that each user can vary the temperature to suit, and as there is no stopper in the sink waste, washing is always in running water. Sometimes knee-action or elbow-action valves are used, but they seem particularly subject to repair costs, and the quick compression hand-operated faucets are more generally used. In cases where the manufacturing process requires volumes of very hot water and the wash sink supply is taken from it, it is well to use a temperature-limiting valve on the line, and more often than not, pressure regulators on both general supply lines will save water and avoid excessive splashing. In some cases a liquid soap distributing system is deemed desirable, but while special mechanics' soap can be had in liquid form most operators prefer their own particular brands, and the trouble required to maintain a soap system can thus be avoided.

Shower baths are frequently provided for workmen, and these are preferably installed in "gangs" with a single pipe feed from a temperature-regulating valve set at a predetermined degree. Such a valve should be provided with a constantly flowing waste to keep the valve "set," but this waste connection can usually be arranged to discharge so that the water can be put to a useful purpose. It is usually considered unnecessary to divide off the showers with partition work; a number of valved heads are grouped in a suitable room with one or two large drains in the floor.

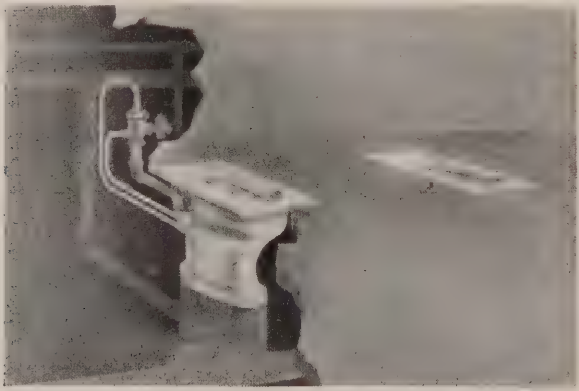
The urinal fixtures may be either the well known earthenware stall type or constant-flush slate fixtures. If of earthenware, the vitreous ware fixture is more permanent and sanitary than the glazed biscuit porcelain on account of its resistance to crazing. At the present time it cannot be obtained wider than 18 inches, but they can be set in battery with three to six intervals. The constant-flush slate fixture consists of especially non-absorbent slate waste trough,



A Continuous Overflow Flush Slate Stall Urinal backs, wing slabs and a flushing trough with serrated edges distributing a constant and even thin film of water over the whole width of the fixture. These slate slabs are built into a unit fixture of as many stalls as may be desired and are standard with either 21- or 24-inch divisions. On account of the exceeding thinness of the water film when properly adjusted, the water consumption will not be unduly great and will probably compare favorably with that of the stall type with hand-operated valves. Whichever type is used, the waste should be set in the floor so the floor will drain into it. No trap under a urinal fixture should be less than a 3-inch to prevent stoppages.

To the selection of water closet fixtures the engineer should give most careful consideration. Some plants employing foreigners have found it necessary to have part of the equipment in "squat closets." The fixture is practically the same as the regular type except that the water surface is farther back in the bowl, and the rim surface is formed into a floor slab. Some doctors claim that this type of fixture should be be used to the exclusion of the generally accepted standard height of from 15 to 16 inches. It is their theory that a squatting posture promotes proper physical action and that the comfortable chair-like bowl interferes with it. Certain it is that the subject has received much thought, for only a few years ago the low bowl had some vogue, and today one prominent maker is forming the rim of his best selling bowl to fit a theoretically proper position. Many of our schools and institutions use the juvenile height of 13 inches, and wall hung closets are frequently set at this height.

Wall closets, if used, should be of the blow-out type and not the siphon action, but they must have flush valve operation and a strong pressure, certainly of not less than 50 pounds. They should be supported from a cast iron "chair" embedded in the wall and concrete floor and not supported by the soil pipe with a yoke. For industrial work the writer's preference is for the 15-inch height standard siphon jet bowl specified by the Federal Specification Board, except that the siphon limb should be enlarged to pass a 2½-inch ball. This extra large waterway is insurance against constantly obstructed closet bowls with attendant annoyance and cost of taking up to clear. The added cost of this enlargement would be more than offset by the cost of disconnecting and resetting for a single stoppage. If these special bowls are ordered, the inspector should see that the stock bowls are not substituted, by passing a 2½-inch wooden ball through each one before permitting its setting and connection. In addition to demonstrating that the specified waterway is furnished, it shows that there is no interior obstruction such as drips or clots of glaze fired on the ware to become catch-alls in service.


Squat Type Closets Operated by Floor-push Flush-valves

Squat Type Closets of Syphon Jet Pattern, at Left of a Wall Type Closet

The method of flushing will depend on available pressure, pipe sizes and other considerations. The practice has become very general to make a complete flushometer installation, but the use of tanks is coming back into favor. With high grade fittings few or no repairs are needed except a single ball cock washer and a new tank ball every two or three years, and it is a simple matter to shut off the valve on the supply and replace them. The average flushvalve rarely goes longer than that without needing attention, and the repair of any one of the several best on the market is a rather complicated matter of several washers and packings. Even the diaphragm type which seems to be the simplest has two or three washers and a diaphragm. The greatest trouble with the tank seems to be the tendency of some workmen to take the cover off and store bootleg and other supplies in the tank, or to use it as a repository for empty bottles, cast-off underwear and the like. This can be checkmated by fastening the cover down so that it requires a special tool to remove it. The better grade of vitreous tank is practically everlasting. Whether tanks or flush-valves are used, a careful selection should be made and adhered to so that it will not be necessary to carry repair parts for several different makes. This also applies in the case of shower valves, sink faucets, and plumbing valves generally. Parts should be interchangeable so far as possible, and a single line of repairs should cover all needs. High grade rubber-covered composition seats are water- steam- and vermin-proof. The hinges should be of cast metal and should be rustproofed by the Bower-Barff process or chromium plated to give a non-corrosive finish.

Sinks. For general wash-up purposes floor sinks are generally preferable to slop sinks in industrial work. Mechanical floor scrubbers are used on large floors, and they can be wheeled over a floor sink and washed out and, in any service, a floor sink will do all that a regular slop sink will and be handier. Floor sinks are set down on the floor construction with the rim flush with the surface so that they act as floor drains. If it should be found necessary to use floor drains elsewhere about buildings for dry manufacturing, care should be taken that there will always be enough water to keep them sealed. Of course, in certain lines of manufacture floor drains are necessary to take care of excess liquid waste and splashings, but in such cases the permanency of trap seal is assured.

So simple a matter as the location and service of drinking fountains has a great bearing on one of the vital points in plant operation,—labor turnover. Proper and satisfactory plant operation requires that the several employes' stations be occupied daily by those familiar with their duties. Constant change of personnel, even temporarily, or temporary but recurring indisposition on the part of employes has a tendency to slow down production and sometimes to interfere with even the quality of the output. Laborers require drinking water, and the temperature conditions under which they work, the character of work, the section of the country and the season all have definite bearing on the amount of water needed to maintain the workers' health at par and on the manner in which it should be provided, so it is not possible to plan an installation without these facts as a basis. The subject of drinking water furnished in manufacturing plants has been the subject of much study by medical men working with some of the largest industrial organizations in the country. The almost universal opinion among them is that the lack of care in the item of drinking water causes much layoff on account of stomachic and intestinal disorders, and is a frequent cause of cramps and diarrheal disturbances, upsetting the rhythm of work, especially where employes work on a traveling assembly or where work of gangs under high temperatures is the rule.

The human skin is an important factor in elimination and in keeping the worker's body fit. The skin cannot do its duty unless supplied with moisture. Employes engaged in light manufacturing in cool rooms do not drink as much as heavy workers or those working in high temperatures. The workmen should and will drink from about a minimum of three pints to over a gallon a day, depending on conditions. The amount to be furnished should be about twice the amount of the use estimated. The consumption will be less when light work is done in moist, cool surroundings without moving about much. Dryness, heat, moving about and heavier work will increase the amount.

Two considerations are important. The drinking fountains must be generous in number so that no employe need go far to quench his normal thirst. Unnecessary distance tends to make for fewer drinks, and each drink of more water than necessary, sometimes even of harmful amounts, whereas if fountains are clean and inviting and handy it results in many small drinks that don't tend to waterlog the intestinal tracts and induce sluggishness. The second consideration is the temperature of the water served. Ice cold water, especially ice water, if taken while the body is heated, has a tendency to produce cramps and the following intestinal disturbances, and under certain conditions this may stop body perspiration and induce "colds." Continual recurrence of this condition may have a definite and permanent effect on health. On the other hand, employes will not drink water so warm as to be unpalatable, and their health and effectiveness suffer from a lack of moisture. The consensus of medical opinion, as expressed by those working directly in industrial plants, is that a temperature at the mouthpiece of about 50° Fahr. should be maintained. This temperature makes some artificial cooling necessary. No natural ice cooling arrangement can function satisfactorily. If the cooling is handled at a central unit and the water pumped through circulating lines, the connected unit should be small enough so the water would leave the pump not lower than 47° and be not warmer than 53° at the return. It is probably better to have individual cooling units which can be maintained at a definite pre-determined temperature. There are a large number of manufacturers of these refrigerating units, and there is almost infinite variety to select from. Care should be taken, however, that the selected unit is so constructed that the cooling element itself containing the refrigerant in either gaseous or liquid form is not immersed in or in direct contact with the drinking water, as the gas might escape through a minute leak and contaminate the water. For instance, sulphur-dioxide gas escaping into the water would form sulphurous acid, which is good for neither man nor pipe on account of its corrosive action.

As to the fixture itself, the diagonal stream is generally considered the most sanitary, and probably the dual stream gives the best shaped bubble for drinking. It should be adjusted to the point where the "bubble" gives a sufficient amount for a satisfying drink without the drinker feeling an urge to follow the stream down with his lips, to contaminate or be contaminated by the nozzle.

The water supply and sewerage planning for a manufacturing establishment is not necessarily complicated, but the layout varies with every different line of manufacture and with the local conditions present. Paper mills use vast quantities of water, soil it in the process, and then must get rid of it. Certain types of reduction plants and steam power plants are also heavy water users, as are cloth finishing works and large laundries. On the other hand, garment factories, cloth print shops, and similar businesses use little water, and a multitude of other industrials vary between the extremes.

Cross Connections. The provision of quantities of water for manufacturing purposes lies outside the plumbing field and is taken care of in plant installation, but certain precautions must be taken against contamination of the water supply for purely human use such as drinking, washing, and sometimes cooking, and it is quite within the province of the plumbing designer to see that there is no opportunity for cross connection between the two uses or between the pure water supply source and the source of water used in plant operation, if they be different. It is not enough that there be a checkvalve between the two, because unfortunately checkvalves do not always work, and even when they do, a single deadly bacterium can pass through the tightest checkvalve ever made during a temporary unfavorable difference in pressure, and populate the entire domestic supply in a few hours. The same thing can happen if the system is designed with an emergency gate valve between the two systems. A complete contamination does not always require that the valve be carelessly left open.

The only definite and positive preventive of cross connection is a complete separation with an "airbreak" between. This can be accomplished by setting up an emergency supply for the industrial needs by discharging the potable water through a balanced ball cock over an open surge tank and pumping from the tank into the industrial line. This pumpage power can be taken from the supply itself. In the days before city water treatment became general, it was quite a customary thing to use the city supply of hard water and to install in each building a duplex pump powered by hard water to pump a soft water supply from a cistern. If the normal city pressure is greater than the industrial supply pressure, there will be no water wastage in the duplex pumping process, but if they be the same or the industrial pressure greater, then there will be an overflow wastage which, however, will usually involve less cost on excess water charge than the cost of current and maintenance of an electric pump. Sometimes this small wastage can be led to storage tanks for boiler feed or other purposes. With these duplex water pumps, an entirely automatic arrangement can be made, the relative areas of the pistons and proper valves being all that is necessary, whereas an electrically-driven unit arranged for automatic service would need pressure-control valves, contactors, starters and similar apparatus to keep in repair.

There are innumerable cases where epidemics of disease have been definitely traced to careless or inefficient cross connections in industrial plants. The threat of reduction of pressure on the clean water side is always present. This is especially true with city water pressure, which is likely to drop appreciably during daily peak consumption in homes. Mains sometimes break or a joint blows out and cuts down the pressure, or there may be a bad fire and the fire department pumpers "bleed" the main. In any of these cases, instead of the supply flowing *to* and *into* the plant's system, it flows *from* the system out into the mains. Any purposedly or carelessly opened valve on the supply to a mixer, vat or other apparatus, instead of filling it simply empties its contents out into the clean water mains of the plant and the city. On return to normal this contaminated water can be drawn at the kitchen sinks in the neighborhood of the plant or even at the drinking fountains in the plant itself, and the owners of the establishment are both morally and legally responsible.

In one case on record, hides were soaking in a vat, and the attendant desiring more water opened the supply valve during a bad fire and the soaking liquid was immediately sucked out into the city mains, creating in the weeks that followed a scourge of anthrax. Scores of serious cases and many deaths were reported. A typhoid epidemic with several fatalities followed a similar opening of a valve in a steam power plant cross connection between the city supply and a condenser supply from a polluted river. An unusual but extremely serious case with many deaths occurred when a hose from a clean water supply was put in a vat of chemicals (one of which was arsenic) and the attendant, after going to another part of the building to turn the water on, returned to find the chemical vat empty. There are scores of such cases on record, and the only sure remedy is a positive air break between the city supply and the industrial supply, and in the plant itself an air break between the industrial supply and the supply to drinking fountains, lavatories, wash-up sinks, showers and similar fixtures. If thought necessary, excess industrial water may be used to flush closets and urinals, but there is the ever-present possibility that an ignorant workman may cut in a cross connection when putting in a new fixture or making repairs and extensions. The definite air break can be had in several ways: by a duplex pump or a power pump drawing from an open surge tank; by the city supply feeding a roof tank when only low pressures are needed in industrial lines; or with vertical loops some 40 feet high with an automatic air relief valve set at a pre-determined release pressure.

Pipe corrosion is serious enough to warrant very careful planning. Corrosion or rusting of water supply pipe not only reduces its capacity progressively during the process but ultimately makes necessary its replacement, and it is a prolific source of repair annoyance and costs. High grade brass pipe (80 per cent or more copper) is of course a very great protection against corrosion, but in large plants the pipe cost would be prohibitive, and it is cheaper to provide deactivators to remove the oxygen by passing through beds of steel or iron scrap or by automatically adding an alkaline solution. Chlorine and alum, frequently used to assist in clarifying during settling or filtration, only make water more corrosive by gleaning out the turbid elements which tend to protect the pipe. The alkaline solution, usually lime, is added after settling. The larger cities of the country are now treating their municipal water supplies to reduce the rate of corrosion, and some of them have been very successful; but it will be many years before such treatment is universally applied, and in the interim, the architects and engineers for industrial buildings and plants must ascertain whether the city supply under consideration is so treated, and if not, must plan their own treatment. Up to a few short years ago little was known about pipe corrosion, but several separate studies have been and are still being made by the different metal trades bodies, and by various government agencies, and enough definite knowledge is now in hand to indicate that it can be controlled up to certain limits. We can measure the rust-forming water conditions from day to day, or hourly if need be, through the use of a common indicating solution that can be handled by an ordinary laborer, and adjust our alkalinity accordingly.

Pipe. As to material for our water piping system, if high grade brass is beyond our budget, cast iron pipe will unquestionably give the longest and most satisfactory service, and should always be used when underground or in contact with concrete. Unfortunately, cast iron pressure pipe cannot be had in the smaller sizes used in general plumbing connections, and we must use either galvanized wrought iron or galvanized steel. Screw pipe wherever practicable should be exposed for inspection and painting so as to reduce outside corrosion. Many experiments have been made for ascertaining relative life of wrought iron and steel pipe. The results seem to show that while corrosion covers greater areas in the steel pipe, the pitting is deeper in the wrought iron. Pipe makers believe that the effective removal of the mill scale can be accomplished and that it will reduce pitting. However, the evidence points to a usually longer life for the wrought iron pipe. The cost of installation is the same.

The sewerage of industrial buildings or plants more often than not calls for earnest study. In some manufacturing lines great quantities of waste must be handled. In others trade wastes, sometimes offensive and even poisonous, must be neutralized, at least partially, and still others carry great proportions of solid matter in suspension. The day is passing when we may dump our unusual waste indiscriminately into city sewers, into nearby rivers, or spue it out on the land to rot and spread a stench over the countryside. States have river pollution laws, cities that are forced to maintain sewage treatment works are jealous of their sewer systems, and the county health official is abroad in the land.

If the sewage is to be discharged into the city sewerage system, or if it is to be treated in a septic tank before discharging it into a nearby stream, it must approximate domestic sewage in composition and contain only such putrescible matter as can be reduced by the plant to which it is bound, all other matter being removed or neutralized by special treatment. Heavy matter in suspension can be removed by suitable rotating screens, and the screenings can be de-hydrated and baled. Other suspended solids and colloidal matter can be removed in settling or sludging tanks, and the effluent chemically neutralized. If the plant is large enough to justify attendance, the sludging process can be of the activated type and sufficiently complete to justify omission of the septic tank and the use of a timed contact bed on the effluent. The de-hydrated sludge resulting from this process can be bagged and sold, possibly for enough to pay the cost of the operation. The Milwaukee sewage works cannot furnish enough bagged sludge to satisfy their market, and this condition is general wherever such systems are in use.

The design of the sewerage system itself is of course dictated by the size of building or plant and the processes used. If the plant is very large, consisting of many scattered buildings on a level tract, it may be found advantageous to keep the sewers closer to the ground surface than would be possible if a normal and necessary grade is given to the sewer lines. This can be accomplished by dividing the tract of land into areas, discharging the sewage of each area into a manhole limited in depth to 7 or 8 feet, and installing in it an air- or steam-operated automatic lift to raise the sewage to near the surface, from whence it will flow by gravity to the next manhole, repeating the process from manhole to manhole.

Under no circumstances should the fall of the sewer be unduly flat, especially if sewage has much matter in suspension. The use of automatic sewer flushing basins is sometimes necessary on the dead end of a sewer, but they should never be used on the assumption that when used they permit flatter grades. The necessary sewer grades are dependent on several factors, but a general average velocity of flow of about 4 feet per second, at least in the smaller sizes, must be maintained to make a sewer self-scouring. Small sewers must have more grade than large to maintain an even velocity. In the absence of accurate computation to a theoretical finding, there is a "rule of thumb" rule that is accurate enough for all practical purposes,—"provide one foot fall in each 10 feet times the number of inches diameter,"—one in 40 for 4-inch, one in 60 for 6-inch, one in 80 for 8-inch, and so on. But it is also well to consider that increasing the fall increases capacity and reduces sizes, and for that reason alone, a number of short, well graded sewers with manholes and lifts intervening, make for a small, well scoured and easily accessible main line, whereas a long flat graded sewer must be larger and subject to stoppage, and the far end may be very deep and inaccessible for cleaning, repairs, connections or extensions. Roughly speaking, doubling the fall will increase the capacity some 40 per cent or more, and a correspondingly smaller sewer can be used.

If securing a permanent and trouble-free sewer system is the sole consideration, extra heavy cast iron pipe with calked lead or iron cement joints will be selected for the sanitary lines, and unless there are acids and corrosive chemicals to be handled, cast iron should be considered for the industrial waste. With its lead lock joints, modern cast iron pipe makes a straight, smooth, even sewer without leakage, and strong enough to prevent settlement or displacement. If acid wastes inimical to metal surfaces are to be carried, it may be necessary to use hard burned tile pipe, but if used it should be laid with hot poured bituminous cement joints, on a continuous bed of steel reinforced concrete, and with all joints completely enveloped in cement mortar. Needless to say, this construction approximates the cast iron sewer in cost, but reinforcing and concrete are necessary to protect it and keep it in alignment and put it on a service par with the cast iron construction. With strong acid wastes, silicate iron special acid-resisting pipe may be required, but it is necessarily expensive, and whether to use it or not will be indicated by the concentration and temperature of the waste handled. Suggestions for the use of concrete tile pipe are often made, but so far concrete tile reasonably proof against bottom erosion and top disintegration due to gases in sewage has not been placed on the market. Some lengths may stand the test, but the texture varies, even from the same lot and no line is better than its weakest piece of pipe.

For the soil and vent pipe above ground and the vertical industrial wastes and the rainleaders, the most economical and lasting construction again favors extra heavy cast iron. Wrought iron or steel screw pipe might be favored by a contractor for reasons of his own, and it is very often used in hotel, apartment house and similar building work where there is objection to the hubs of the cast iron pipe coming in the story height, but in industrial work this consideration is nonexistent, and permanency is the aim. The rough plumbing should follow the accepted "Hoover Code" construction, with all fixture traps vented by stack or separate vent lines unless the local regulations provide for more complete venting.

7.a.

THE
ARCHITECTURAL
FORUM

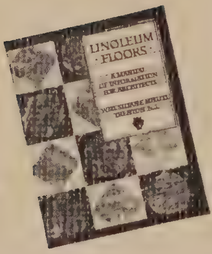
IN TWO PARTS

PART ONE
ARCHITECTURAL DESIGN

OCTOBER
1929

Interior of Southwestern Bell Telephone Company Building at Fort Worth, Texas. Double-Waxed *Linoleum, made by W. & J. Sloane. Photograph un-retouched.*

Linoleum delivered to job with DOUBLE-WAX FINISH



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LUPTON

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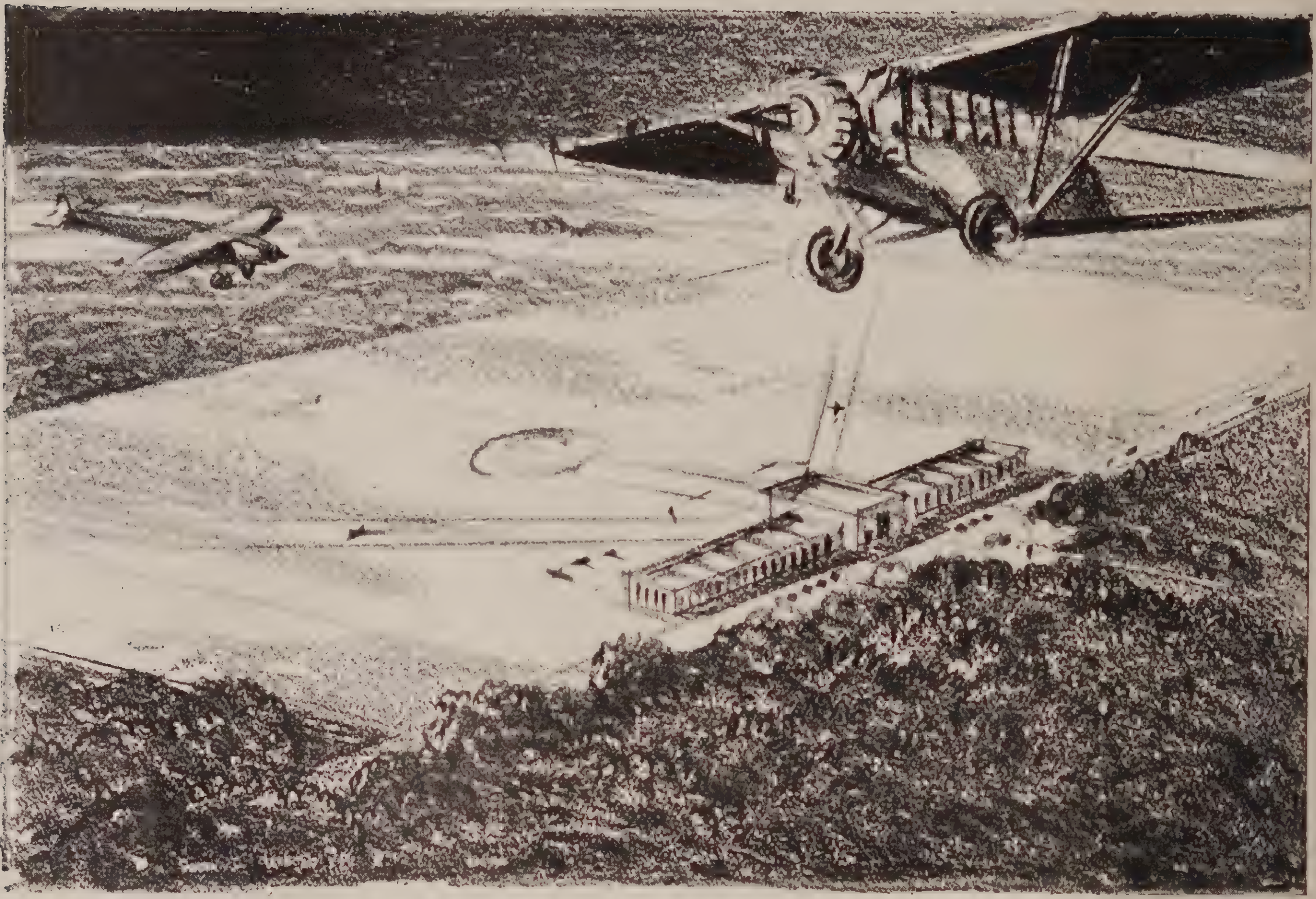

Closing November 18, 1929

Help solve the nation's air traffic problem by entering the Lehigh Airports Competition.

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Authorities name $250,000,000 as a conservative estimate of the cost of airport development during the past 12 months, and prophesy that more than double that amount will be expended for this purpose during the next two years. Wise employment of this enormous capital depends in the last analysis upon trained creative minds, with technical knowledge and experience competent to grasp and solve this modern problem.

As a first step, the Lehigh Portland Cement Company announced last April a competition for the design of a modern airport. This competition is open to every architect and engineer in the United States. The widespread and enthusiastic response received indicates that technical experts welcome this stimulus to sound thinking and to broader public interest in airport development.

And perhaps no competition has ever carried such important collateral value to the competitors. It will introduce to the aeronautics industry a general recognition of the importance of architects, engineers, and city planners in solving the essential ground problems of the world's newest mode of transportation.

Immediately upon the completion of the competition the Jury of Awards, consisting of the chairmen of the four sections of the Program Committee and other members selected by them, will judge each entry for excellence of design, practicability from an engineering and aeronautical standpoint, and ingenuity in developing the various structures and their disposition with respect to the landing area best to handle the air traffic of today and the immediate future.

Winning designs and those receiving honorable mention will be widely published for the guidance of national and local organizations interested in airport development.

All entries remain the property of the competitors and will be returned within at least one year after the completion of the competition.

There is yet time for you to prepare a well-considered contribution. Programs containing full details of the simple requirements of the competition have been widely mailed. If you have not received your copy, a wire to the Lehigh Portland Cement Company, Allentown, Pa., or Chicago, Ill., will bring you one by return mail.

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C. Stanley Taylor, of Taylor, Rogers & Bliss, Inc., *Manager*

The Program Committee, which also serves as an advisory body during the period of the competition, is divided into four sections—Architecture, Engineering, Civics and City Planning, and Aeronautics, and includes the following men of outstanding prominence:

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Allentown, Pa. Chicago, Ill.

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November 18, 1929

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Third Prize	1,000		

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BOOK DEPARTMENT

EARLY AMERICAN WROUGHT IRON

A REVIEW BY

ROBERT STUYVESANT HOOKER

ONE of the most encouraging details of modern building practice is the careful attention that is being given to the matter of choosing and designing hardware and metal fittings. It may be said, in fact, that in this respect we are in the midst of a renaissance of good taste in use of metalwork. In colonial times the instinctive striving for beauty, coupled with use of primitive methods of manufacture, was instrumental in producing a class of work characterized by a simple, rugged beauty that has never been surpassed. But as time went on anvils and hammers used by skilled artisans gave way to machinery and quantity production methods, so that hand-wrought iron was largely superseded by the cheaper cast iron, and simple purity of design developed into over-elaborate, florid motifs of no artistic value whatever. Recently, however, due to the revival of interest shown in many such things, there have been springing up about the country, studios and forges operated by earnest and skilled craftsmen to supply the demand for authentic reproductions as well as for original work in wrought iron. The greatness of the demand for such articles is most encouraging and leads one to hope that there will follow a very real and important development. From the standpoint of the architectural designer, too much care cannot be given to the use of hardware as ornamental and decorative features. The metalwork furnishes strong, contrasting notes that serve to lend snap and vividness to the subject, and its use may make or mar the effect sought.

The sources of reference on which to base a study of the early work in wrought iron are limited largely to the pieces themselves which because of their rugged construction and lasting qualities are still to be found in old buildings scattered here and there about America, as well as in private collections and public museums. As to the lives or even the identities of the early smiths who created these pieces, very little has come down to us, either in written and printed records or from any other source. Some slight idea of the way in which they worked can be gained from the old shops with their anvils and forges, a few of which are still in existence, but as to the sources of design and the men themselves, nearly everything is left to conjecture and imagination.

Balcony Railing, Colt Mansion, Bristol, R. I.
Illustration from "Early American Wrought Iron"

Iron work began very early in the American colonies. Almost immediately, deposits of iron were discovered in bogs and swamps, and it was this "bog iron," together with some imported metal, that was used largely during the early period. At first, of course, only the simplest and most necessary objects were made, and the design was governed almost entirely by utilitarian considerations. As living conditions became less severe and there was more leisure, ornamental work began to appear, and various degrees of refinement in design were reached. Although this development was quite general in character, it is easy now to discover regional and national influences on the work found in the various sections. In the northern region the rigor of the climate and the struggle for existence permitted only use of the most simple and useful household fixtures and hardware. On the other hand, in the southern colonies where life was more tranquil and where the social and economic system gave rise to greater concentration of wealth, the life of the times is reflected in the design of elaborate wrought iron balconies, fences and entrance gates. The nationality of the colonists also had a marked effect on the design motifs, the predominating style being of course English, due to the predominance of English settlers. Other important national styles are the Dutch in New York and New Jersey; the French in New Orleans, and the German in Pennsylvania, while the Swedish influence is strong in Delaware and Maryland, as is the Spanish in some of the southern states. In a general way, it may be said that the four most important sources of material of this sort are New England, especially Connecticut; Pennsylvania; New Orleans; and Charleston.

The rapidity with which good examples of early wrought iron are disappearing, due largely to lack of

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appreciation and care on the part of their owners, has led Albert H. Sonn to spend several years in conducting an investigation of the subject and in making sketches of meritorious examples wherever they might be found, whether in museums, private collections, or in their original positions in old houses. In the latter case, Mr. Sonn has made much original investigation and has conducted something of a house-to-house canvas in search of interesting bits of early ironwork to be sketched and included in his three-volume work on the subject, entitled "Early American Wrought Iron." These volumes have recently been published and are very impressive in their physical proportions. Each volume is 10 by 13 inches and contains an average of about 240 pages, including very interesting introductory discussions and a complete bibliography. The main and most striking feature of the work is, of course, the plates, of which there are in all 320, taken from pencil drawings by the author. It is this reviewer's opinion that no more effective means could have been found for presenting the subject of wrought iron than that of pencil drawings, especially when they are as well made as these. Certainly, Mr. Sonn is a master of pencil technique, and his ability to express the distinctive character and ruggedness of wrought iron is positively uncanny. Another pleasing feature of these plates is the scale of the drawings. The large size of the pages permits many of the objects to be presented at almost full size, and all are of such generous proportions that none of the effectiveness of the wrought iron texture is lost. The plates in most instances contain drawings of several objects each, and it may be imagined what a wealth of material is presented in this way on the 320 plates. Opposite each plate is a printed description of each article shown, giving, wherever possible, its approximate date, the place where it was found, its size, and other important details. In many cases the author points out important features of the designs and discusses interesting incidents or facts.

Volume I is devoted almost entirely to early American door hardware, with particular reference to door latches and their development from the crude wooden latches, through the various styles of wrought iron latches to the latch-lock combinations, several examples of which are presented for the purpose of showing how latches developed into the more modern locks. The wooden forerunners of wrought iron door knockers developed into the interesting (though quite rare) combination known as the "knocker latch." There are also some sketches of the ingenious escutcheon lift latches, a few examples of which have been found in this country. Then there are innumerable examples of Suffolk and Norfolk latches in all the variations of the popular arrowhead, ball and spear, bean, swordfish, tulip and heart designs which were so popular in early times.

Volume II is also concerned with door hardware, with special reference to such pieces as hinges and bolts and with many sketches of the doors themselves, showing the hardware in place. Here again a wide variety of designs are shown, the most important being cockshead, H and H L hinges, butterfly, serpentine and strap hinges. Several plates devoted to fittings taken from the quaint Conestoga wagons of the early German settlers in Pennsylvania and catches, hinges and straps from old chests and sea chests, contain much interesting

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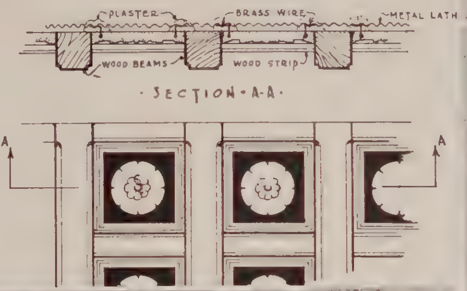

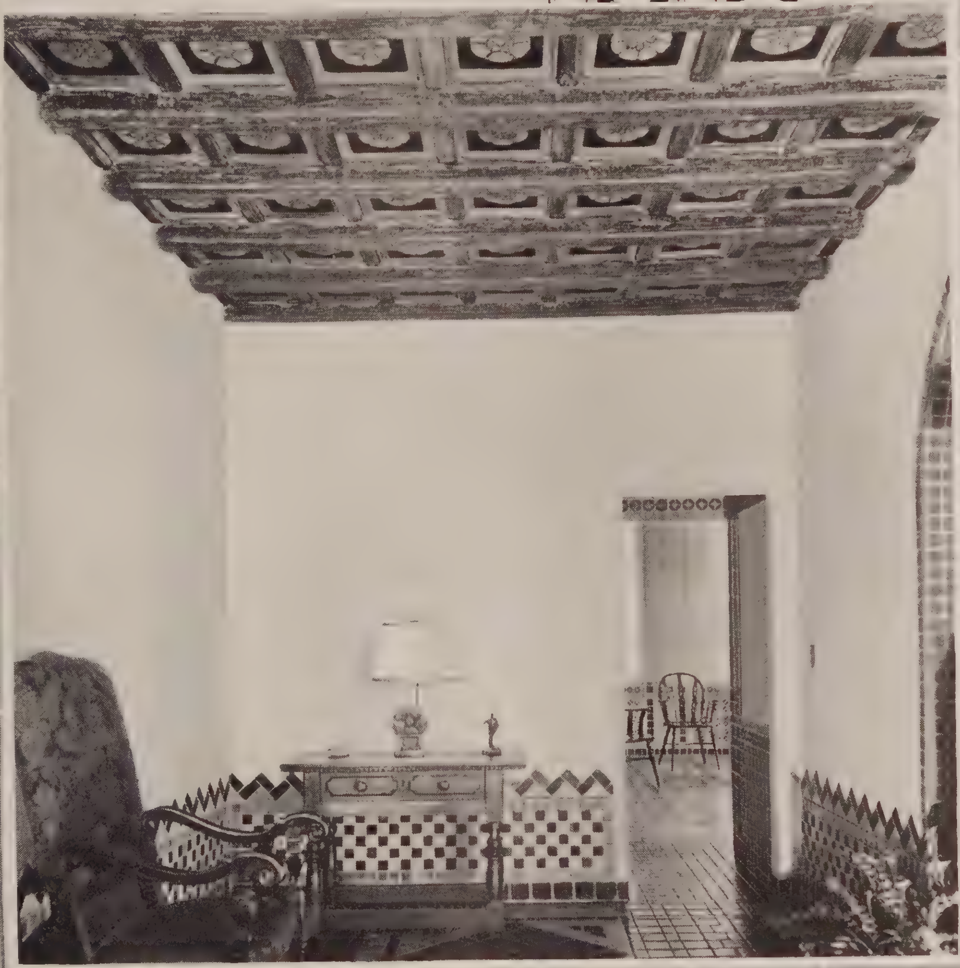

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and valuable material. Volume III presents a greater variety of objects and is of the greatest interest from the architectural point of view. Here are shown elaborately designed wrought iron balconies and braces, railings and newels, gates and grilles from all parts of the country, notably from Charleston and New Orleans. The quaint, old world charm of both these places is due in no small measure to the effect of their elaborate iron balconies, fences and gates, and the author presents sketches of well chosen examples from both cities as well as of some very beautiful gates and balconies from Virginia, New England, Philadelphia and other places. They afford a wealth of material of the greatest interest.

Weather vanes, perhaps the most conspicuous of all ornamental metalwork, present an insistent demand for careful design. Many amusing as well as beautiful vanes were fashioned by the early craftsmen, the design motifs being often taken from familiar objects of everyday life. Thus we have vanes portraying ships, Indians, cockerels, arrows, quills and fishes as well as the dated and pennant types. Wall stays and numerals were often used in early buildings, both for structural and ornamental purposes, and the practice is still continued where it is felt that some contrasting touch is needed to break up the monotony of a broad wall surface. The stays and numerals sketched in plates devoted to that type of object afford some very good precedent for this kind of work. The lowly foot scraper has been deemed worthy of consideration by the author, and with good reason, for a scraper adapted from one of the many quaint and graceful designs shown here might very well add a pleasing touch of welcome to the entrance of any modern house. Again the author has made a good and varied selection, and presents sketches of a number of shutter catches found on old houses. Fireplaces, which form such an important feature in all interior schemes, afford a good background for the use of ornamental metalwork, of which andirons are the most effective and decorative features. These, together with the other fittings and accessories usually found about fireplaces, form the subject of several very interesting plate pages.

EARLY AMERICAN WROUGHT IRON. By Albert H. Sonn. 3 Volumes, 730 pp., including plates. 10x15 inches. Price, $35. Charles Scribner's Sons, 597 Fifth Avenue, New York.

RECENT ENGLISH DOMESTIC ARCHITECTURE

A REVIEW BY

DOUGLAS WILLIAMS

IN December, 1928 there appeared an issue of the well known English publication *The Architectural Review,* part of the contents of which attracted such widespread interest and created such an instant demand that within a fortnight the issue was out of print, and it became impossible to obtain a copy of the much coveted number at any price. The continued demand for this issue led the publishers to decide to republish part of the material in the form of a volume, presenting all the plate illustrations exactly as they appeared in the original periodical and omitting only the usual magazine articles. The result of this determination on the part of the publishers to make these valuable plates available to the architectural profession has resulted in a volume which is fittingly entitled "Recent English Domestic Architecture," since it presents examples of houses built more or less recently in a wide variety of styles, ranging from designs in the early Tudor manner to the most extreme modernistic types of which the conservative British are capable, even in this day of advanced designing.

A feature of the work is the orderly manner in which the various examples are arranged in chronological sequence, depending on the historical style which influenced the designing of each. Starting with houses built in the Tudor manner, as one turns the pages one comes successively on the Jacobean and Georgian, and finally to those experiments in modernism reflecting the continental influence. Although the houses are all modern, comparatively few are "modernistic," and the architects of those which do come under this classification have evidently been very slow to take up the new style of architectural design which has become so popular in France and certain other European countries, and there are in England only a very few isolated experiments in this type of work. The examples shown in the present book occur almost entirely at Silver End, Essex, and are the work of Thomas Stail of the firm of Sir John Burnet & Partners. These houses are designed in a modified version of the work of Le Corbusier, with flat roofs, and blank, white wall spaces relieved here and there by window or door openings of unusual proportions. The plans of these houses are not at all unusual, and the whole treatment is handled in such a way as not to shock too much the easy-going and slow-moving British public. As is to be expected, the present-day English architects have been most successful in designing buildings in the Tudor, Jacobean and Georgian styles.

In many instances the buildings here shown are additions to old houses, or else a structure is built about a fragment of some old manor house as a nucleus. American architects will profit much from a careful study of the way in which British architects have adapted the ancient native precedents to their modern buildings. In the matter of plans we might perhaps discover some features which are not entirely satisfactory from the American point of view; for instance, in many of the larger houses it is quite noticeable that dining rooms and kitchens lie in widely separated portions of the buildings; in many cases from 50 to 100 feet of corridors separate the two. While this feature is no doubt desirable from a standpoint of preventing noise and odors, it would hardly be beneficial in helping to solve the American servant problem. There is also a very noticeable scarcity of bathrooms as compared to the number usual in American houses, there seldom being more than two or three even in the largest houses, some of which have as many as 15 or 20 bedrooms. On the other hand, the general practice of placing the water closet in a room separate from the bath has obvious advantages and is worthy of consideration by American architects. As is highly desirable from the architect's point of view, all the exteriors shown are accompanied by reproductions of the plans of the houses illustrated as well as by some data.

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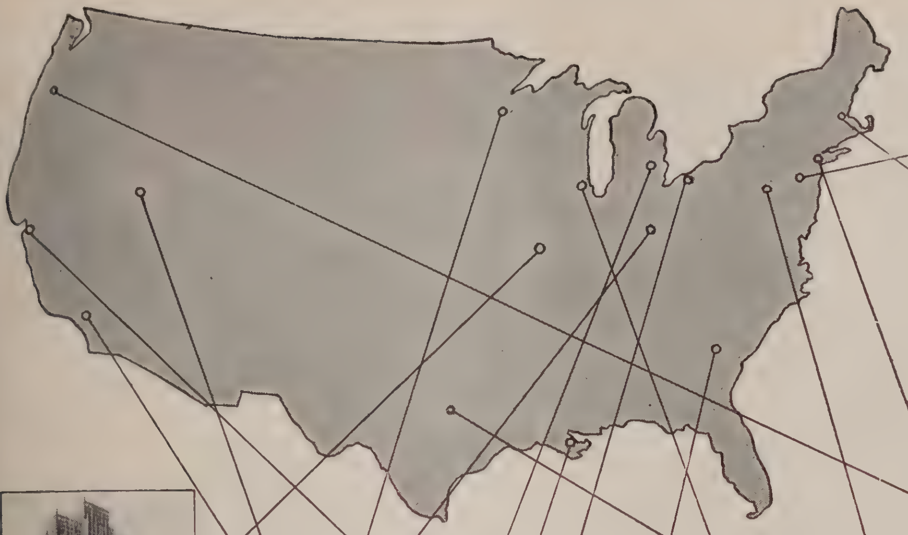

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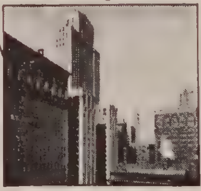

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THE EDITOR'S FORUM

OLD TAPESTRY IN BOSTON MUSEUM

THROUGH the generosity of Robert Treat Paine, 2nd, the Boston Museum of Fine Arts has lately been enriched by a splendid example of late fifteenth century tapestry. While abroad this summer, Mr. Paine purchased the tapestry from Knole House, in Kent, probably the most perfect surviving example of domestic architecture of Tudor England. For more than 400 years the tapestry has hung in the chapel of this famous baronial residence, having been brought to Knole early in the sixteenth century by Archbishop Wareham, then its owner. Like all great houses of early England, Knole House was built in successive stages. Since 1586 it has been in possession of the Sackville family, to whom it passed through gift by Queen Elizabeth to her cousin, Thomas Sackville. According to tradition there are seven courts, 52 staircases, and 365 rooms, the rooms with the exception of the great halls, being small, hospitable, and essentially livable.

The splendid Gothic tapestry, which has after so many centuries left this house for the Boston Museum, measures 29 feet long and 13 feet high. It was woven about 1490, possibly for a cathedral, from which it may have passed into the hands of Archbishop Wareham. This seems possible, since the composition of the tapestry is such as to suggest that the original design included other scenes which may have been cut off at the time the tapestry was installed at Knole between the years of 1503 and 1532, when Archbishop Wareham was in residence there. In the tapestry there are represented six scenes from the Passion depicting the trial and suffering of Christ at the hands of Pilate, Herod, and the populace on the day of the crucifixion. The figures are clad in mediæval costumes of the closing years of the fifteenth century, and each scene is framed in a contemporary architectural design. That the tapestry is from the hand of a very great designer is evident from the drawing and arrangement of the several parts as well from the splendid unified ensemble. While the artist is as yet unidentified, a clue exists in the similarity of the designs of this tapestry and those of the more fragmentary Passion tapestry of St. Maurice, Angers, which is attributed to the much discussed designer, Jean van Roome, and to the no less celebrated Brussels weaver, Pieter van Aelst.

Comparatively few great religious tapestries have survived from so early a date as the Knole tapestry, but many were doubtless woven for cathedrals and chapels, just as many historical and allegorical tapestries were woven for the great halls, and domestic and intimate hangings produced for the retiring rooms of the mediæval houses. The Knole tapestry is one of the great hangings surviving from the Gothic period. It comes to the Boston Museum in an unusually fine state of preservation, with no patching and practically no darning. Its beautiful colors, quite characteristic of Gothic weavings of the late fifteenth century, are rich and uniformly faded.

THE INSTITUTE STUDIES PLAYGROUNDS

THE American Institute of Architects, through its City and Regional Planning Committee, announces the formulation of plans for aiding the improvement and maintenance of school playgrounds. Charles H. Cheney, the chairman of the Committee, says: "The cost of maintaining playgrounds is a problem which most cities find difficult. Development of playgrounds might naturally be expected of the school boards, which have the responsibility of training the children's minds, and which, in some states, at least, must also provide them with physical education; but in no city are school budgets sufficient to do the playground work necessary outside of school hours or to keep playgrounds open in summer. Hence it is common practice for cities to have a separate playground department for play activities. Sometimes this department is placed under the park board, and sometimes under a separate playground commission. To carry on its work, the budget of the city council provides as much or even more money than the physical education department of the school budget.

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FLOOD IN BANK

....rips linoleum from floor tears veneer from table....

TELESCO PARTITION PRACTICALLY UNSCATHED

A FEW weeks ago, on a Sunday, a bursting water main precipitated tons of water into the Director's Room in the Bank of Yorktown, New York City. For practically an entire day the room stood in 2 feet of water. After the water was pumped out, here is what they found:

1. The linoleum had been ripped clear off the floor and had been floating in the room.

2. On the expensive Director's Table in the center of the room, the veneer had been torn away.

3. On a coupon booth just outside the room, the finish of the wood was utterly ruined.

With such havoc around it, you would expect the partition to be a total loss. You might expect it to collapse from the water pressure. Certainly its finish must be destroyed. But as a matter of fact the partition was practically unscathed. For it was Telesco Partition. Its beautiful walnut finish was unharmed, thanks to the exclusive lacquer used. The partition was as rigid as ever except at one point where shelves of stationery stored behind it came tumbling down against it! "We were amazed," writes Mr. J. O'Brien, vice-president of the bank, "at the remarkably fine appearance of the Telesco Partition in contrast to the other equipment in the room!"

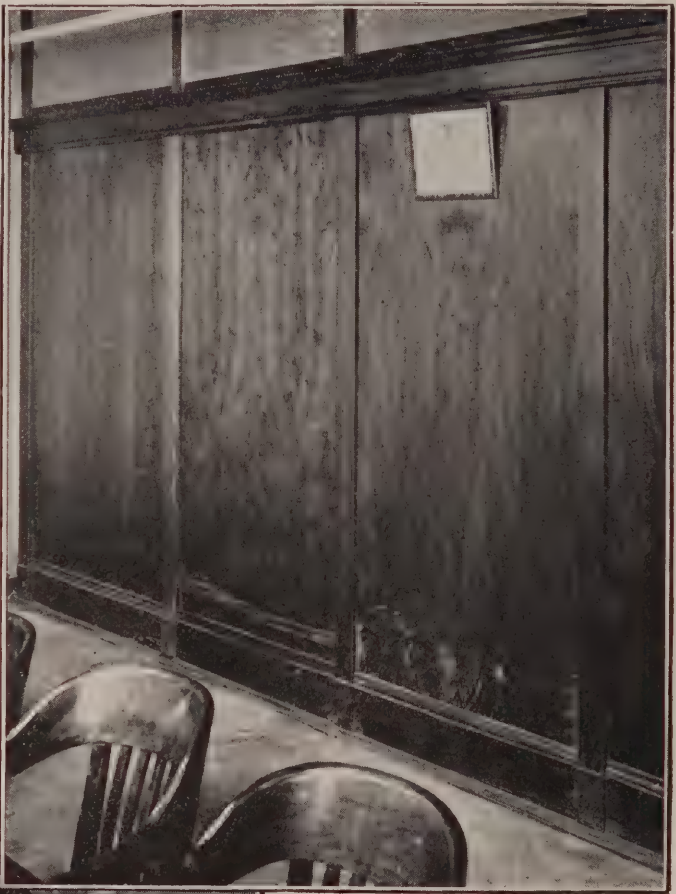
Put Telesco under any test... for durability of finish, for ease of erection, for movability, for *real* economy... and its practicability will amaze you; just as its beauty, in luxurious American Walnut or African Mahogany, will impress the most exacting tenants.

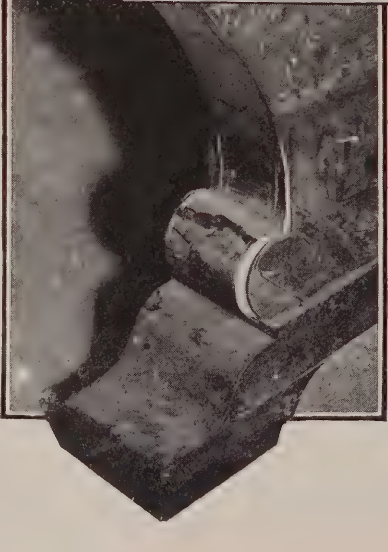
HENRY KLEIN & CO., INC.

with which are consolidated Improved Office Partition Co. and Driwood Corp. (Est. 1909)

Display Rooms and General Sales Office:
Dept. A—40-46 West 23rd St., New York.
Branch Offices in
Detroit, Philadelphia and Pittsburgh
Factory: Elmhurst, N. Y.

Telesco Partition
REG. U.S. PAT. OFF.
IT TELESCOPES





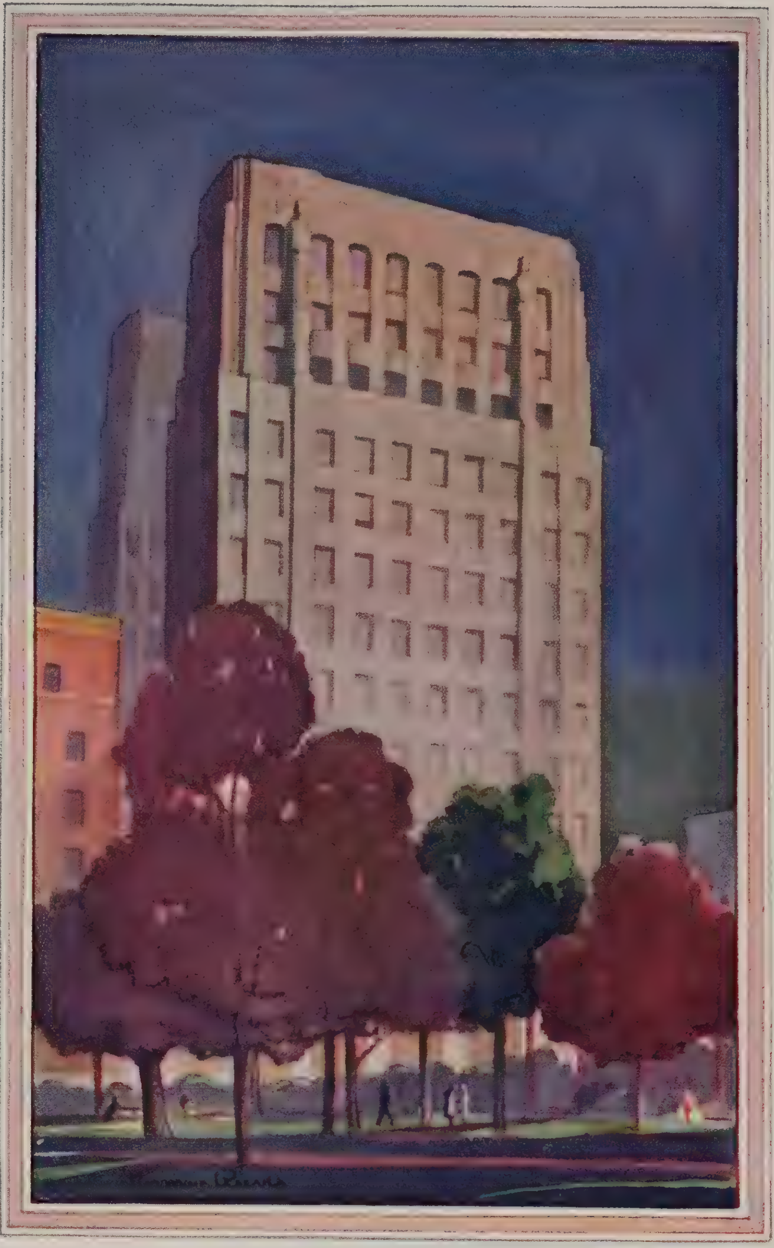
AFTER THE FLOOD

(Photos shown were not retouched)

Above: Telesco Partition, unharmed.
At left: Leg of Director's Table, showing how veneer had been ripped away.

An Invitation

Just off Fifth Avenue, at 40-46 West 23rd St., Henry Klein & Co., Inc. has opened a huge store. Here you will find beautiful examples of paneled rooms for office and home... as well as model offices displaying the use of various types of Telesco Partition. We invite you to come in ... for it is a veritable architectural exposition of craftsmanship in wood.



BUILDING FOR N. W. AYER & SON, INC., PHILADELPHIA

RALPH B. BENCKER, ARCHITECT

From a Water Color Drawing by Norman C. Reeves

THE
ARCHITECTURAL
FORUM

VOLUME LI NUMBER FOUR

OCTOBER 1929

THE AYER BUILDING, PHILADELPHIA

BY

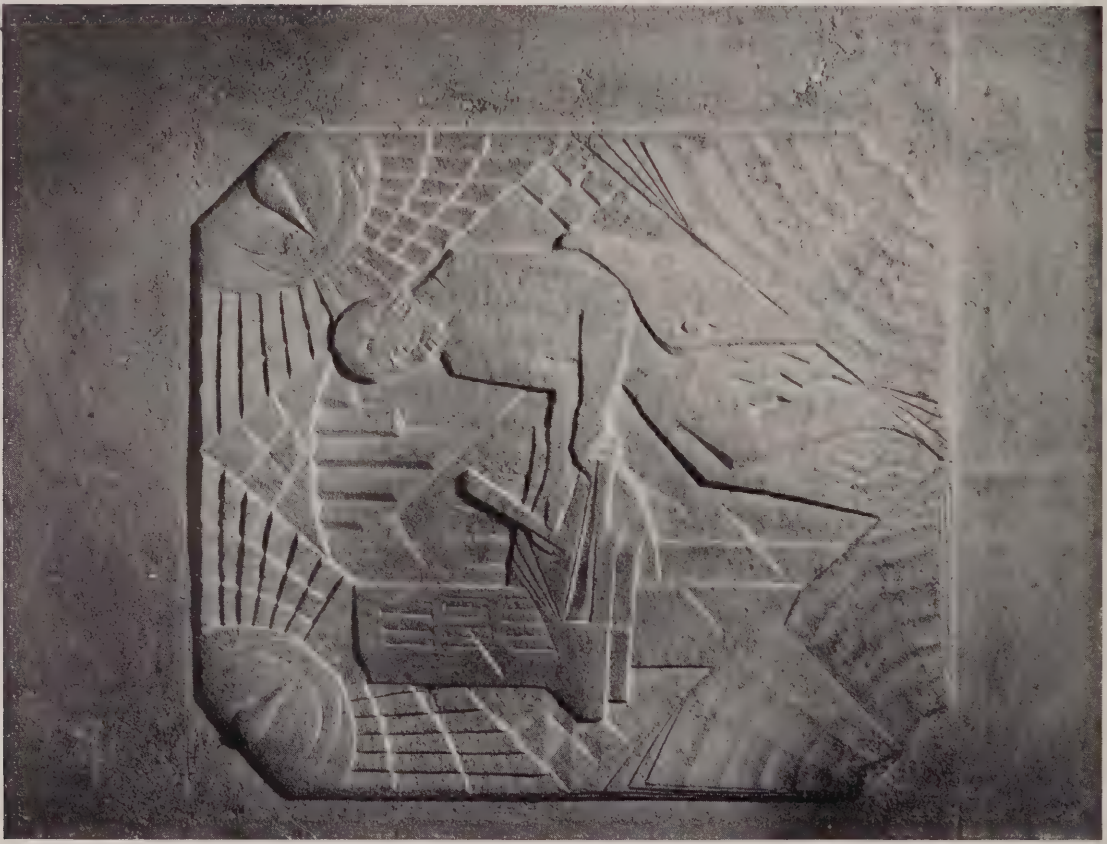
RALPH B. BENCKER, ARCHITECT

N. W. AYER & SON, INC., had looked forward for several years to the time when they would erect a building to properly house their large advertising organization. They had decided, before they engaged their architect, that the design of this structure should not follow any of the established styles of architecture. In an early discussion with me they expressed a desire for a building with all the beauty and dignity of the Lincoln Memorial, but of a design forward-looking, and of the present day. The problem, then, was not to build a monument, but to create an efficient and appropriate structure of simplicity and beauty as a home for the creation of advertising. Together we undertook this work, realizing fully the great opportunity that the problem offered, and realizing also the great responsibility that was placed upon us.

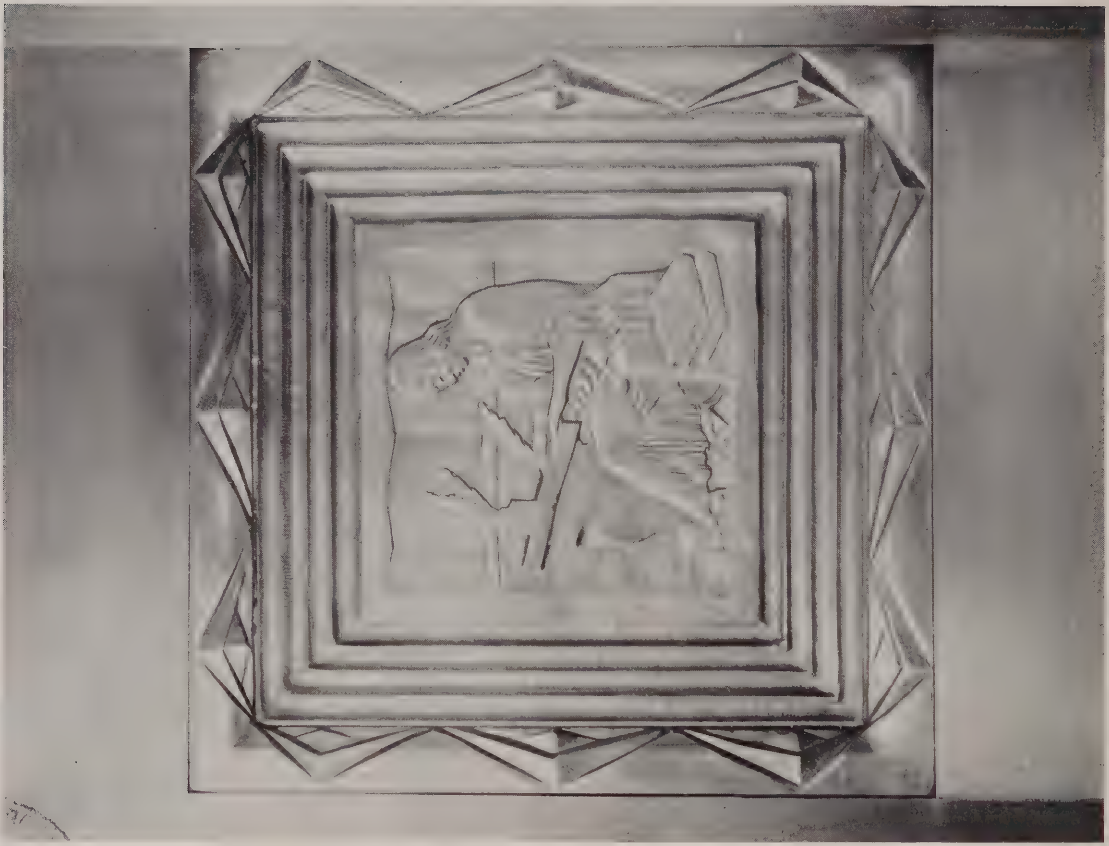
The building of N. W. Ayer & Son, Inc., faces east and overlooks historic Washington Square which was laid out as a park by William Penn. Diagonally across the way is Independence Square, with the old Pennsylvania State House, home of the Liberty Bell, and directly to the rear is the Morris house, dating from the early days of the country. We endeavored to create a design which, while new, would bring no jarring note to this old section of Philadelphia. The exterior of the building is a simple shaft, 13 stories high, of "shot sawed" buff and variegated Indiana limestone, with the three upper stories set back to give a receding, graceful silhouette. The first ten stories measure on the outer walls 103 by 115 feet, with a floor area each of approximately 9,000 square feet after space is deducted for light wells, elevators and stairways. Starting at the line of the setback, flanking each elevation, are two pylons growing out of the strength of the lower masonry, terminating in figures of "Truth," representing the advertising business distributing information to the four winds. These figures were studied to play by form and light and shade interestingly with the silhouette of the building formed by the corner piers. The spandrels below the uppermost arched windows are carved with figures symbolizing the organization of the advertising agency. The motifs used in the decoration of the interior and exterior of the structure were taken from fundamentals of the advertising business; they are the human figure, symbolizing the creative mind, and the figure of Truth; the open book as the vehicle of advertising; and the winged bird as the messenger, symbolizing the widespread power of advertising.

The main entrance to the building fronts the Square, and is in the center of the facade through a bronze and marble vestibule. In the frieze over the doors are two open books with figures representing Truth. In the center is the Sun, the source of inspiration, illuminating two seated figures representing the Executives, supporting one side of the books; on the other side are figures representing "Art" and "Writing." At each end are two figures representing "Youth." The doors are formed with panels modeled in low relief, symbolizing the activities of the various departments of the business of the agency. Directly above the entrance, and centering on the large windows facing the east side of the building, are three panels carved to represent interesting features having to do with the history of the N. W. Ayer & Son organization: the first, the plow; the middle panel, the lamp; and the north panel, the future.

The lobby, with its towering height extending through two stories, has its long axis north and south, with walls of unsually interesting rusticated limestone. To the south of the lobby are three galleries for exhibitions of art and other forms



PANEL ON ELEVATOR DOOR



CARVING IN LOBBY

BUILDING FOR N. W. AYER & SON, INC., PHILADELPHIA

RALPH B. BENCKER, ARCHITECT

Photos. Charles Ogle

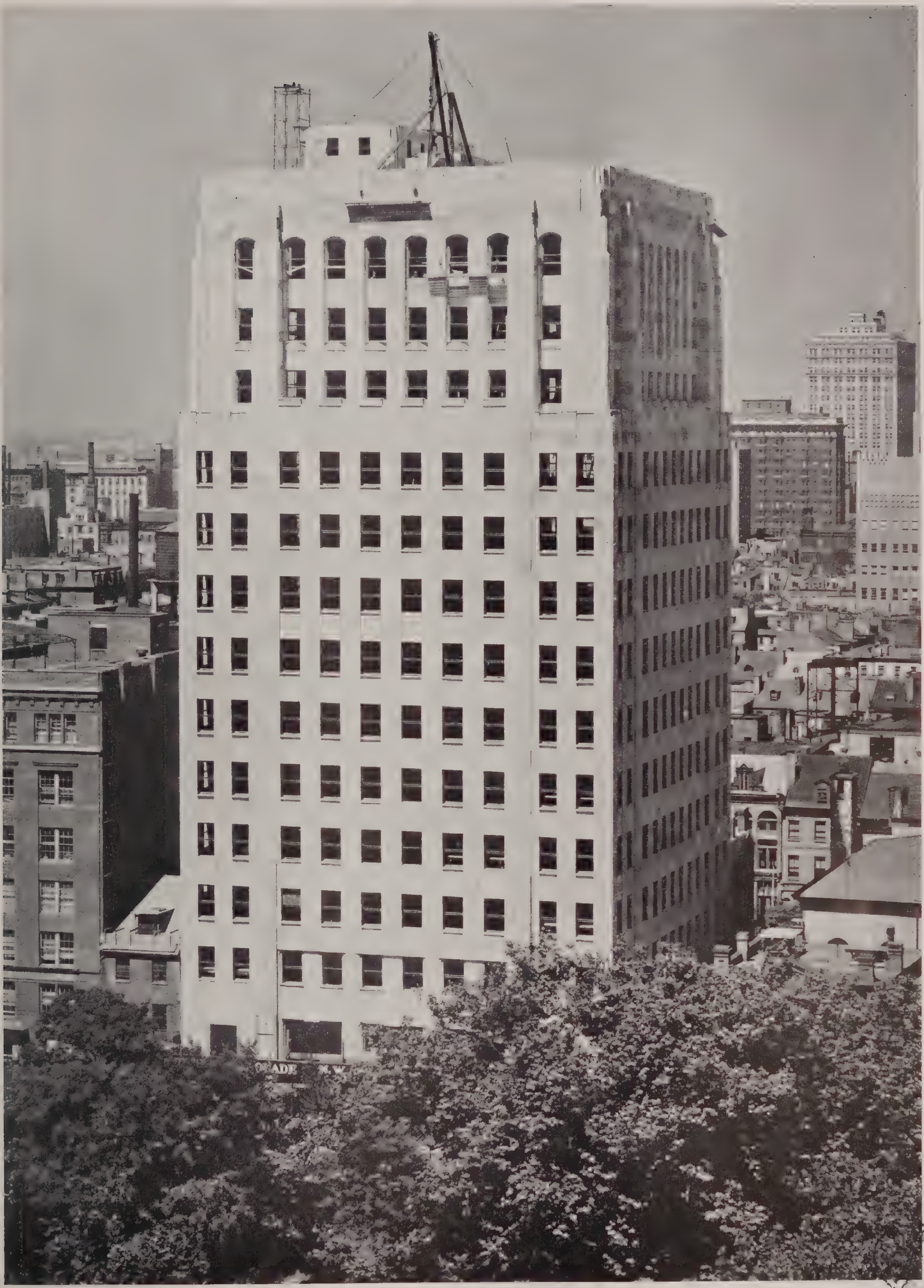


Photo. W. H. Hoodt

MAIN FACADE
BUILDING FOR N. W. AYER & SON, INC., PHILADELPHIA
RALPH B. BENCKER, ARCHITECT

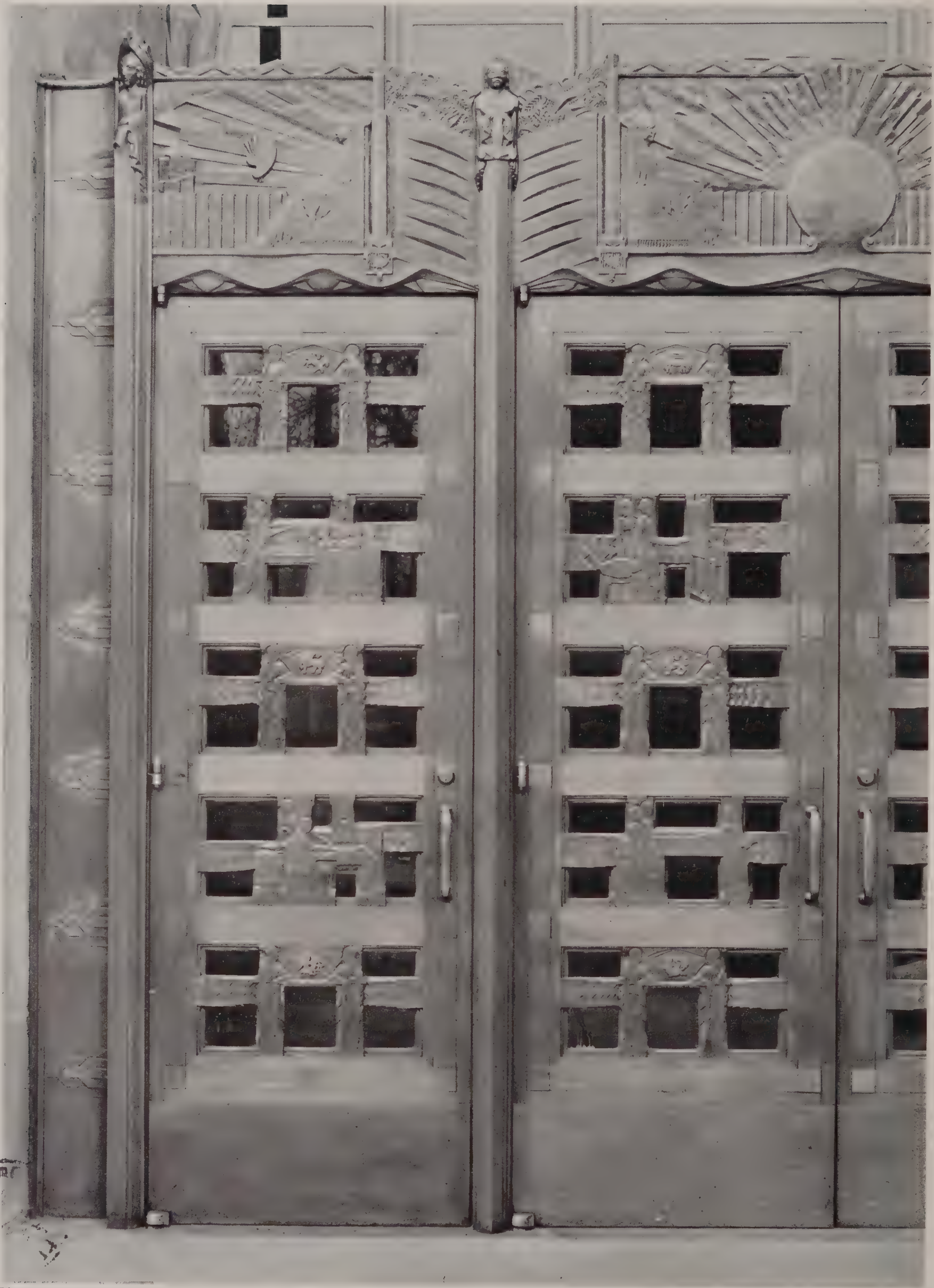


Photo. Charles Ogle

MAIN ENTRANCE DOOR
BUILDING FOR N. W. AYER & SON, INC., PHILADELPHIA
RALPH B. BENCKER, ARCHITECT

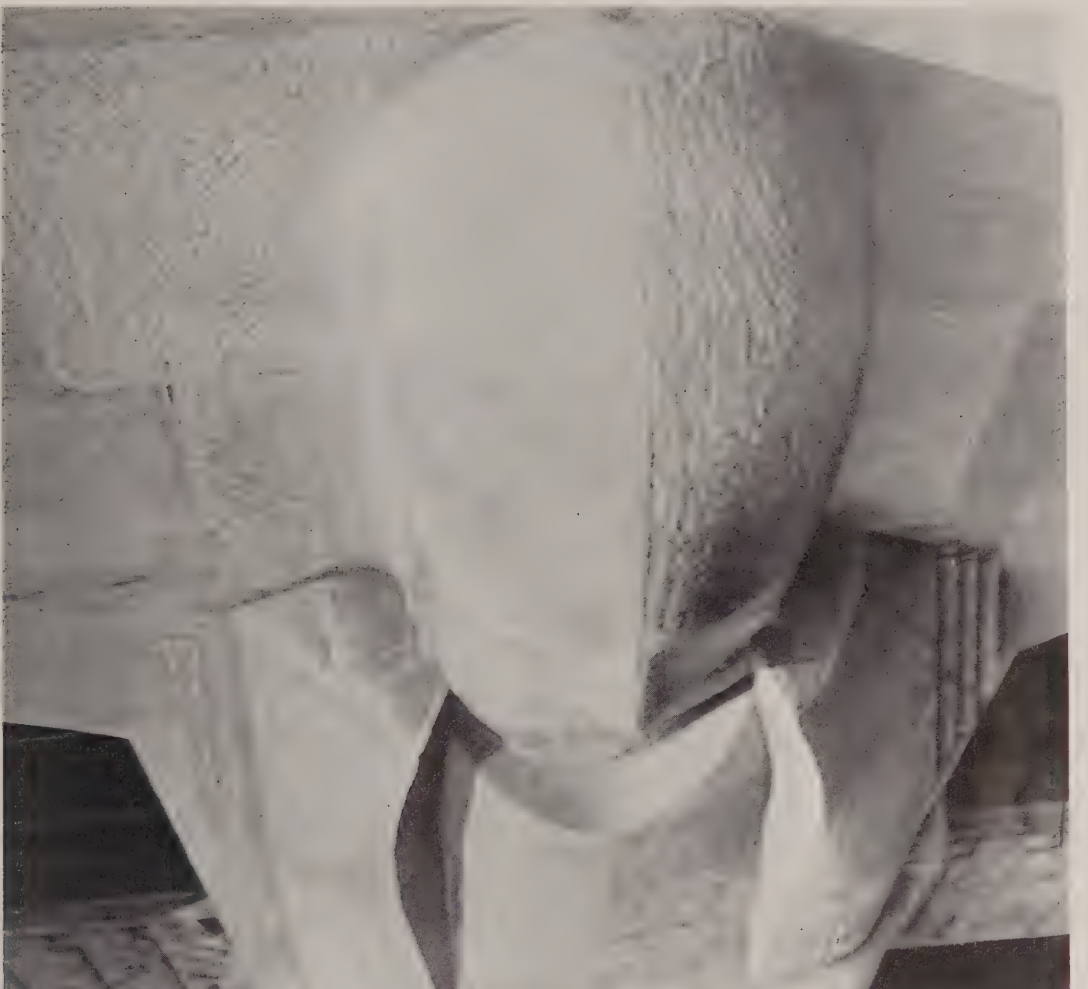


Photo. Charles Ogle

DETAIL OF FIGURE FROM TOP OF BUILDING
BUILDING FOR N. W. AYER & SON, INC., PHILADELPHIA
RALPH B. BENCKER, ARCHITECT

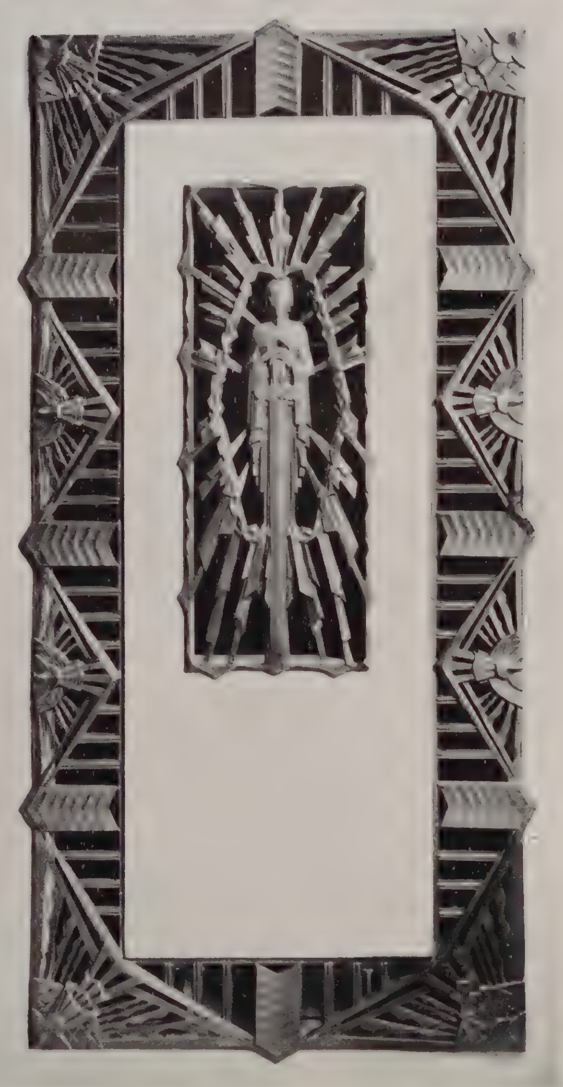


Photo. Sigurd Fischer
RADIATOR ENCLOSURE, MAIN LOBBY

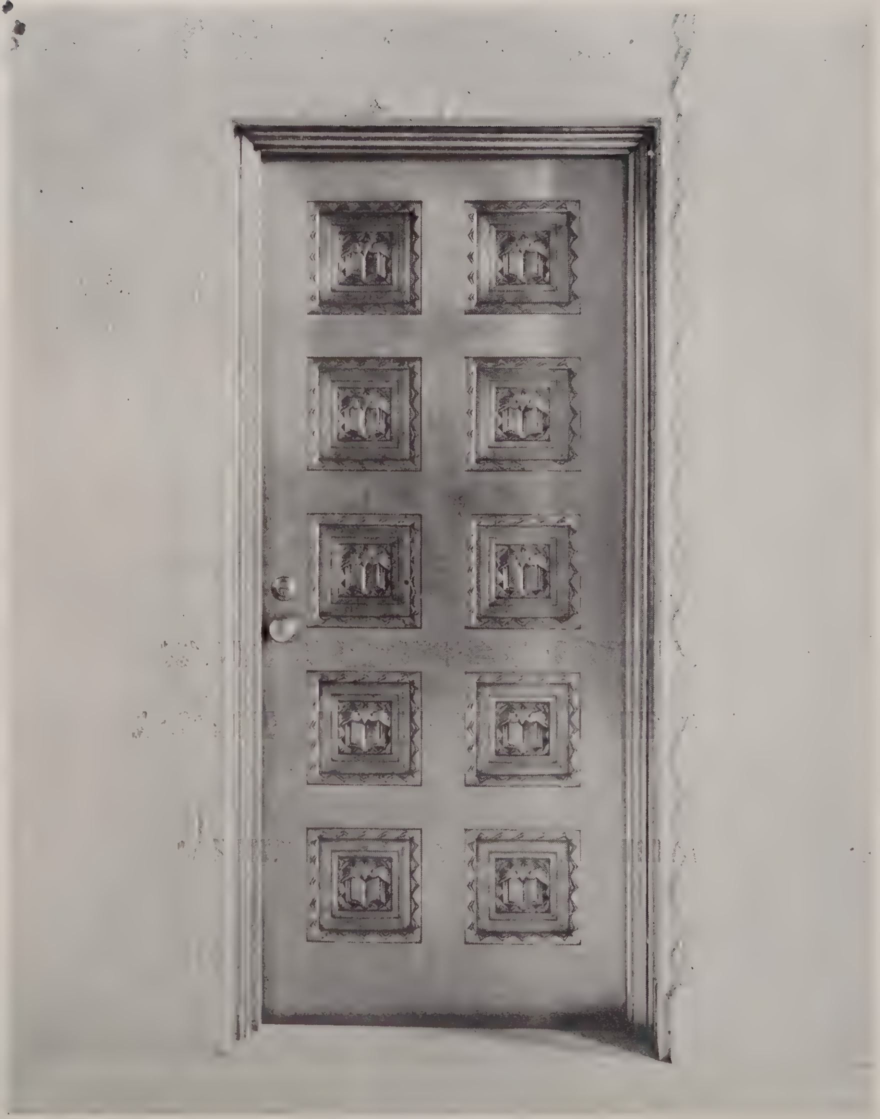


Photo. Charles Ogle
DOOR FROM ELEVATOR LOBBY

BUILDING FOR N. W. AYER & SON, INC., PHILADELPHIA
RALPH B. BENCKER, ARCHITECT

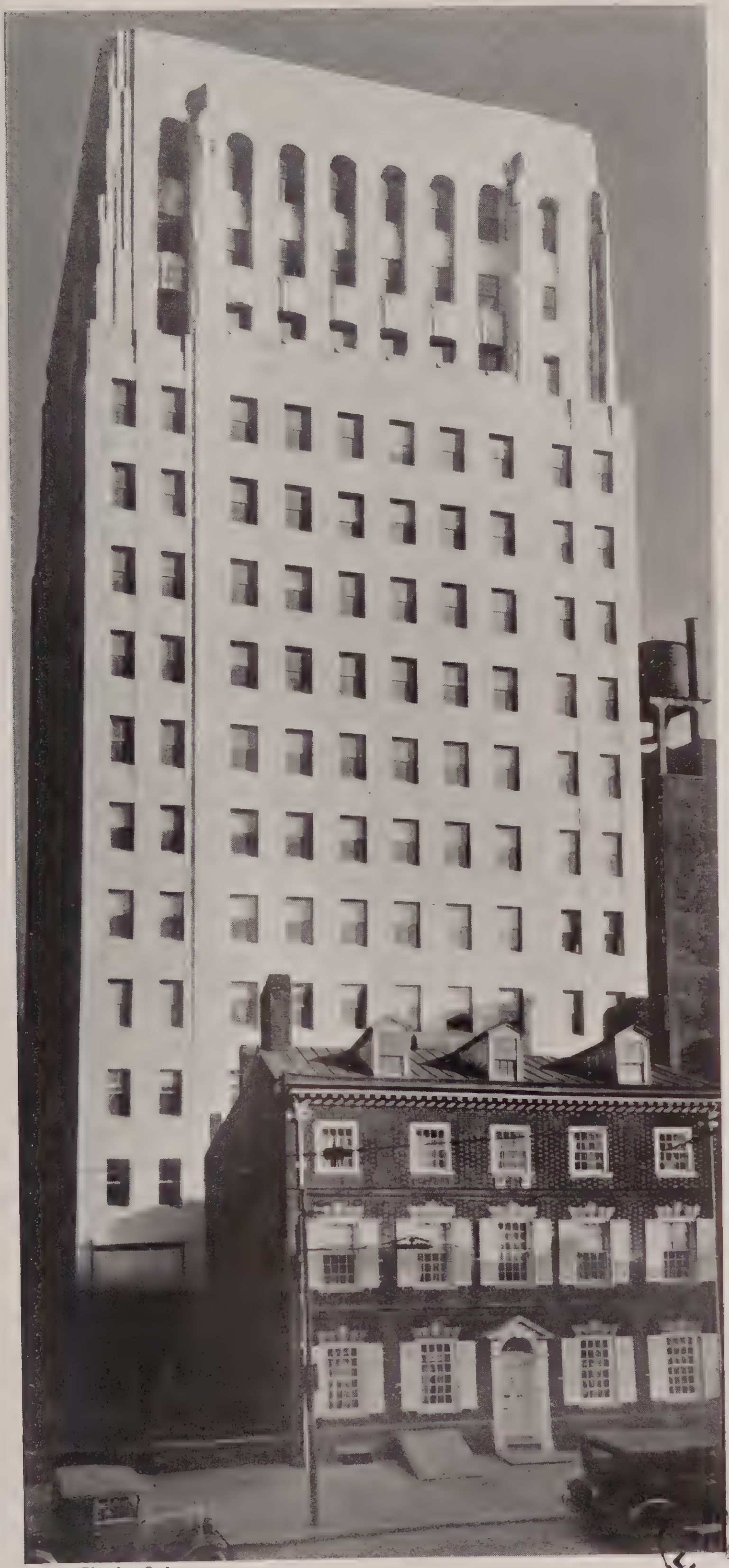


Photo. Charles Ogle

BUILDING FOR N. W. AYER & SON, INC., PHILADELPHIA
RALPH B. BENCKER, ARCHITECT

of the work which has to do with advertising. The walls are of texture fabric with paneling in walnut. The main gallery has walls of a soft gray-green fabric with three painted horizontal bands of receding black, extending into the dull blue of the curved ceiling lines above. When seen through the stone opening from the lobby, this gallery adds a charming color note to the lobby setting.

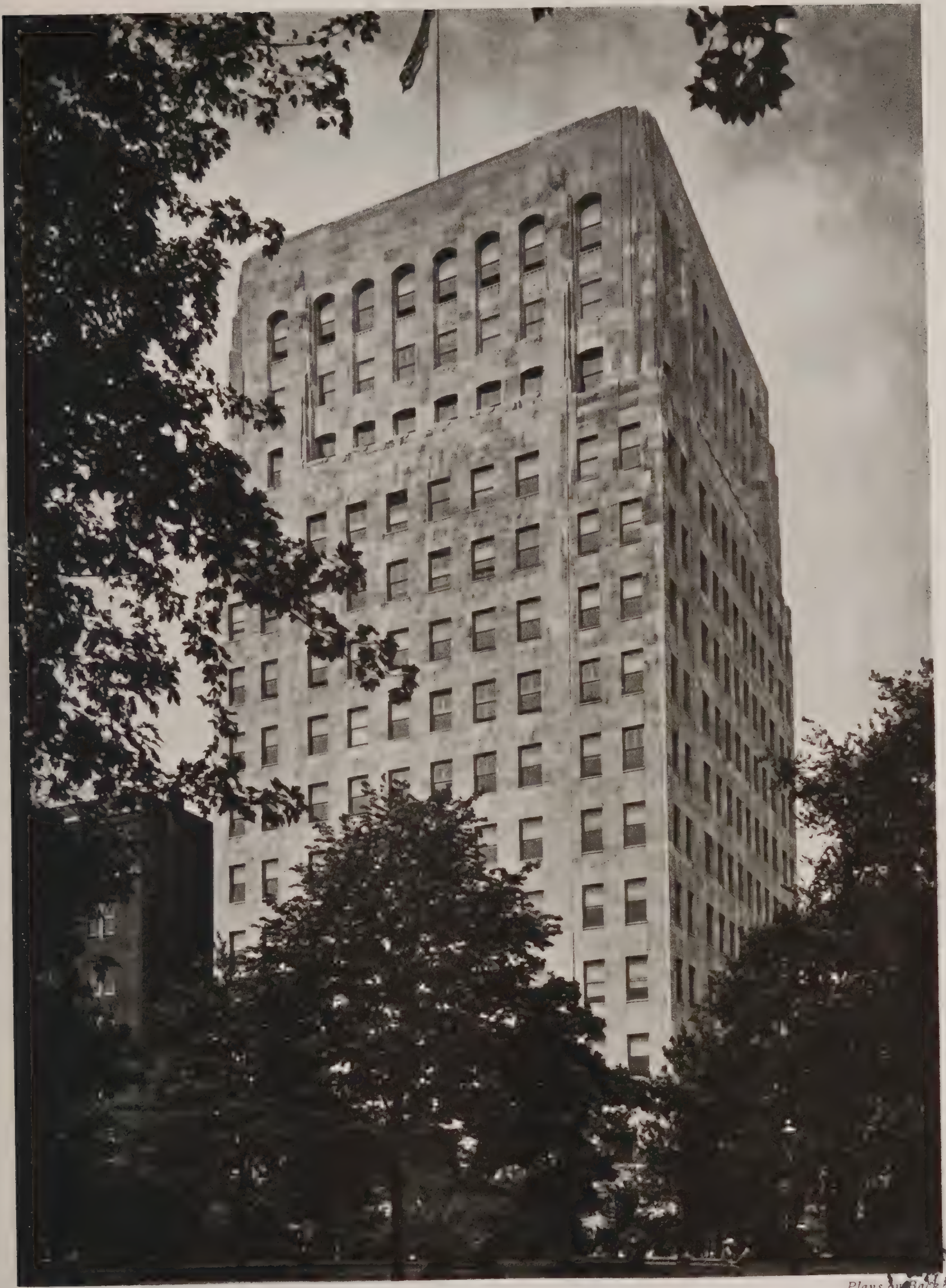
On the west side of the main lobby, directly opposite the entrance, is the elevator lobby with its walls of soft colored limestone, topped off with an indirect light cove, in which are used cast glass inserts which produce an interesting effect in that they eliminate the hard, dark line which is usual in indirect lighting coves. The cast glass is below the top line of the cove member, and by its faceted sides it diffuses the light rays directly below and above, and softly blends the light above the cove with the walls below. Between the main entrance hall and elevator lobby there is a pierced limestone grille carved in design which shows rays, as of light, radiating from the emblem of N. W. Ayer & Son to various races of the globe. This grille, when seen from the entrance hall or from the elevator lobby presents an interesting decoration because of the play of light, since one side has indirect light, the other direct light.

The space on the first and second floors not occupied by the entrance and gallery is used for the printing department. This space has been soundproofed, and the presses have been mounted on platforms of cork so that in the lobby or in any other part of the structure there is no indication that huge, pulsating, vibrating machines are operating just on the other side of the lobby walls. The various other departments occupy the typical floors up through the building to the 13th. These floors are all planned with a maximum of light, with flat ceiling underfloor duct system, and a system of artificial light distribution to allow for the greatest possible flexibility in department arrangement and future growth. Throughout the building it has been the aim to provide the most favorable of working conditions, not only in the matter of light, air and elbow room, but also in an arrangement of departments which permits of the close coöperation necessary in a well knit and cohesive organization. Throughout the structure, temperature regulation was installed, controlling the radiators which are all concealed within the walls under the windows, covered with metal plates and painted in colors to match the walls, giving to the various floors an unusually fine appearance and a clear floor span.

On the 12th floor are the executive offices and main conference rooms. The entire 13th floor is used for an assembly hall and cafeteria, in which the organization can be brought together on both business and social occasions. The roof is used for recreation, being paved with tile, and from it there is obtained a wonderful view over the city and the Delaware River with its shipping.

On the occasion of the laying of the corner stone of the new building, February 4, 1928, the 80th anniversary of the birth of the founder of the firm, F. Wayland Ayer, the president of the corporation, Wilfred W. Fry, outlined in brief fashion, the general scheme on which the structure was erected. "In preparing for this new building," he said, "we took ample time for planning, we have sought to let purpose and material control design, to mould form to decoration rather than decoration to form, and to approach architecture through logical, structural channels. We believe this new home will fulfill in completeness, efficiency, comfort and simple dignity all that we can hope for in this modern structure of steel and stone. It is safe to assume that with such a building, planned, arranged and equipped to meet our particular needs, with facilities coördinated by many years of experience, in the light of modern practice and with the help of modern mechanical devices, our service to our clients should be measurably quickened and broadened."

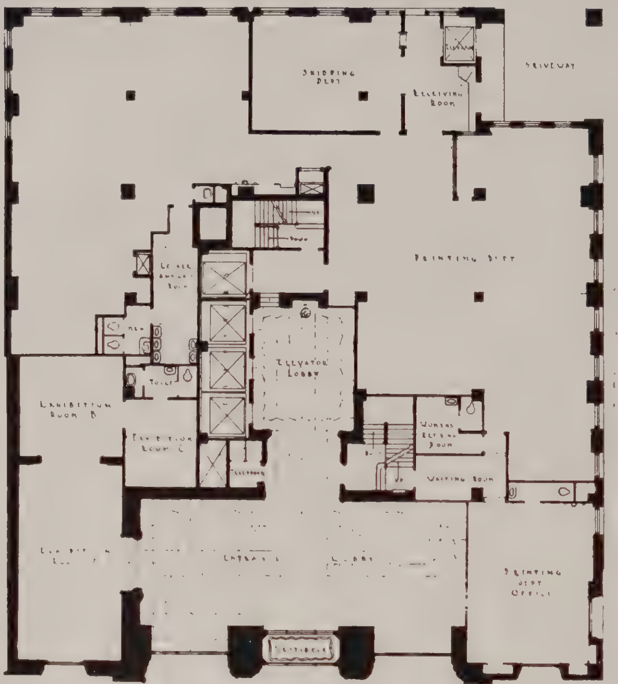
The pride which every individual in the Ayer organization feels in its new business home, is summarized in the words of one of them: "There are some in the advertising business, outside of our organization, who have seen in this new building a significance beyond its immediate importance to us. They have said, graciously, that it is a symbol of the stable state to which the advertising business has been brought, as an accepted force in modern industry and commerce. It is natural that we should like to feel that this is true, because ever since this business was founded by Mr. F. Wayland Ayer in 1869 it has been the earnest purpose of him and the organization to conduct an advertising business that would command the respect and confidence of the public."



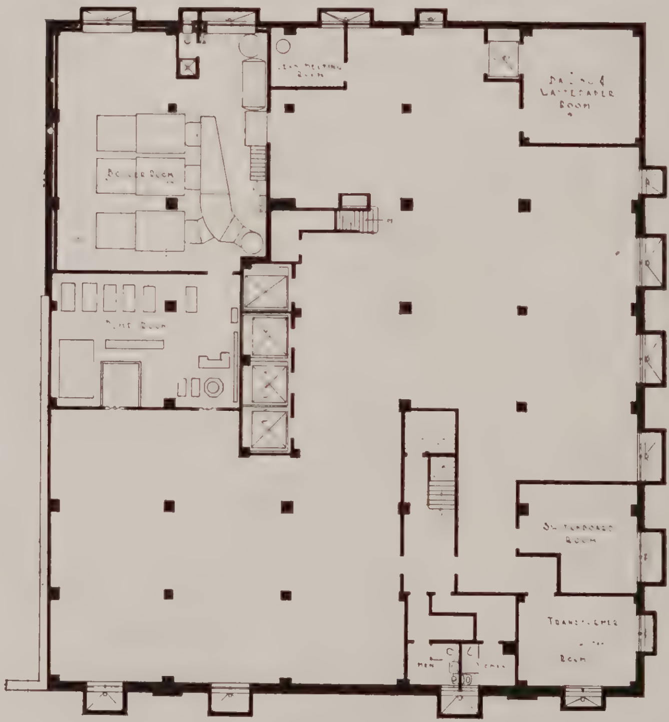
Photos. Sigurd Fischer

Plans on Back

WASHINGTON SQUARE FACADE
BUILDING FOR N. W. AYER & SON, INC., PHILADELPHIA
RALPH B. BENCKER, ARCHITECT

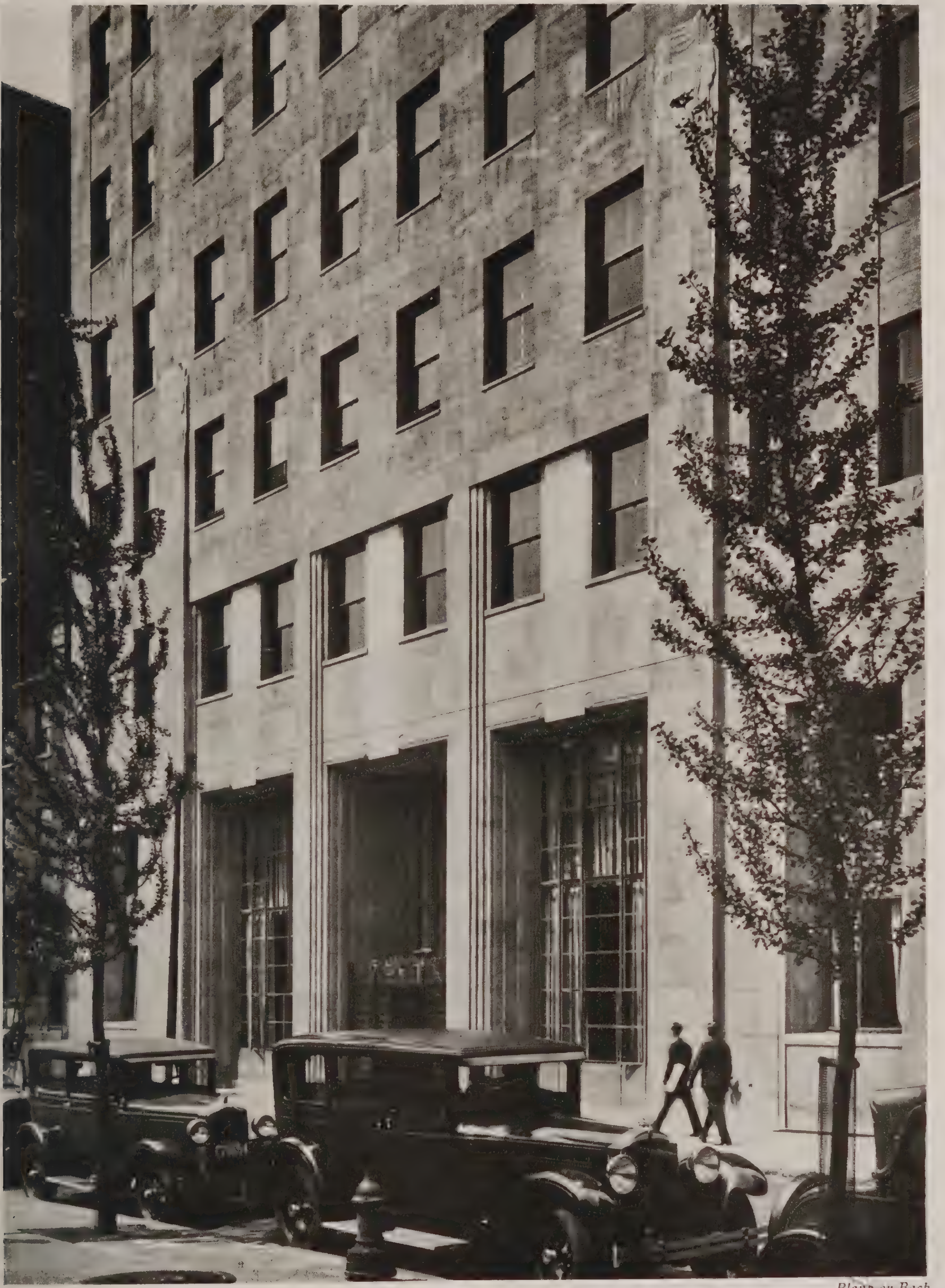


FIRST FLOOR



BASEMENT FLOOR

PLANS. BUILDING FOR N. W. AYER & SON, INC., PHILADELPHIA
RALPH B. BENCKER, ARCHITECT

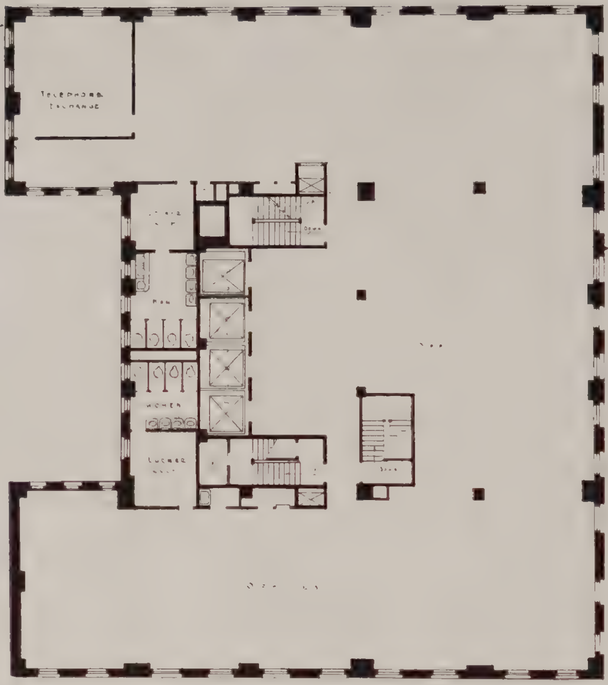


Plans on Back

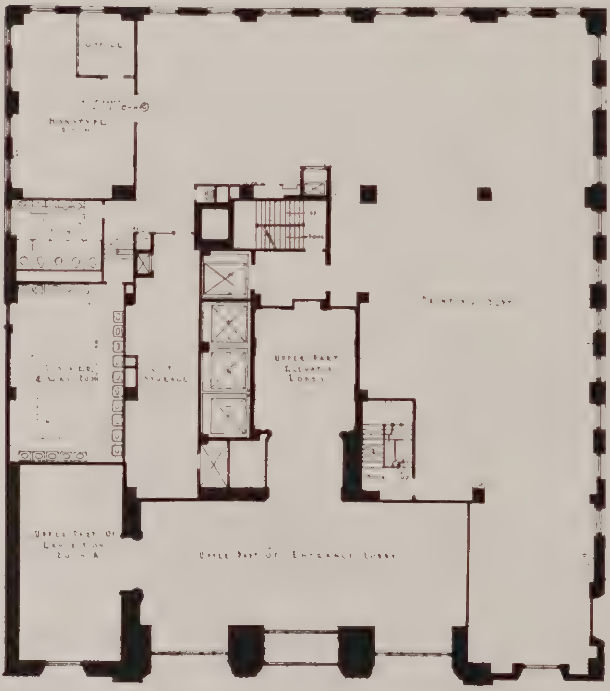
FRONT ELEVATION

BUILDING FOR N. W. AYER & SON, INC., PHILADELPHIA

RALPH B. BENCKER, ARCHITECT

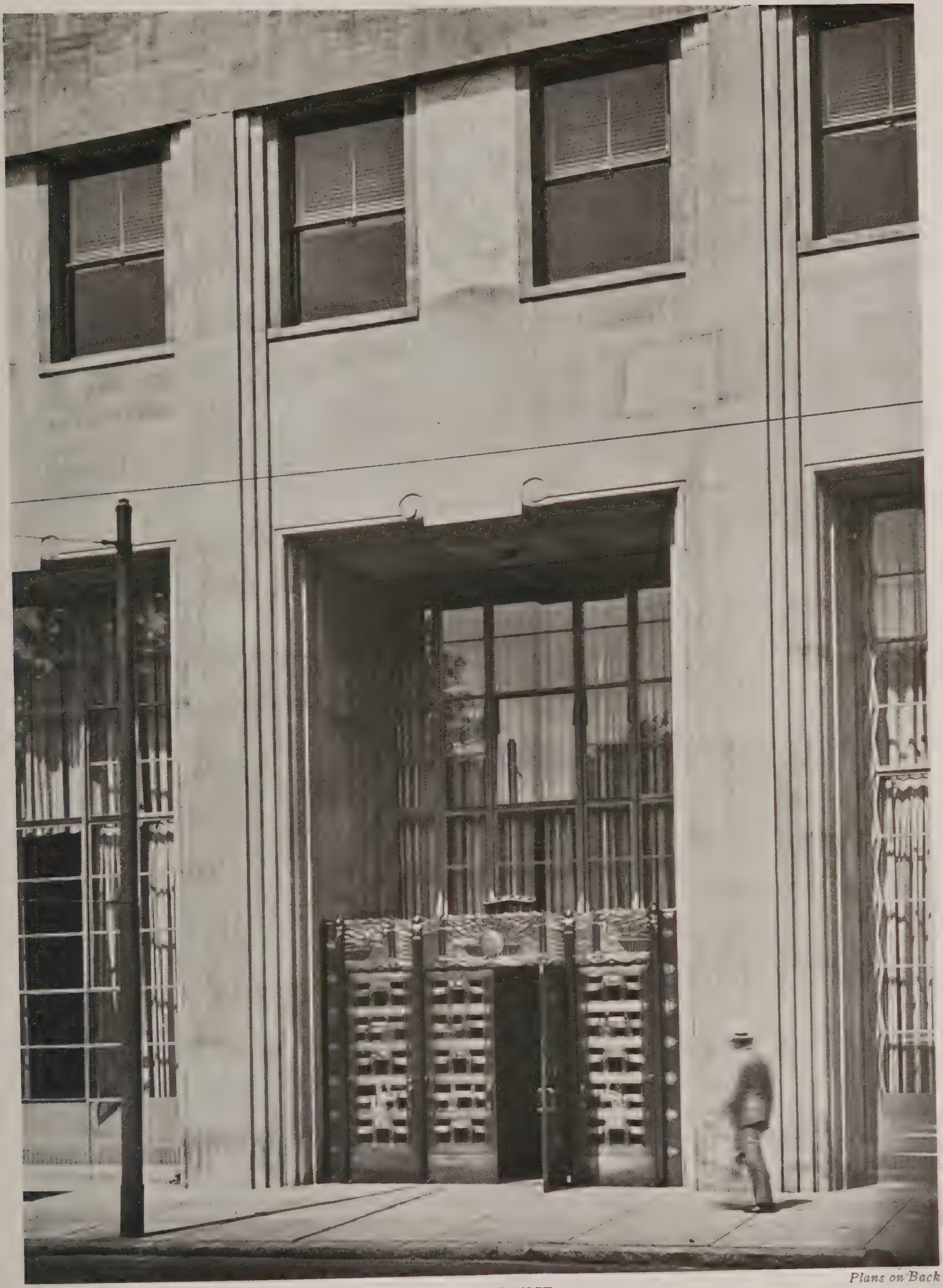


SECOND FLOOR



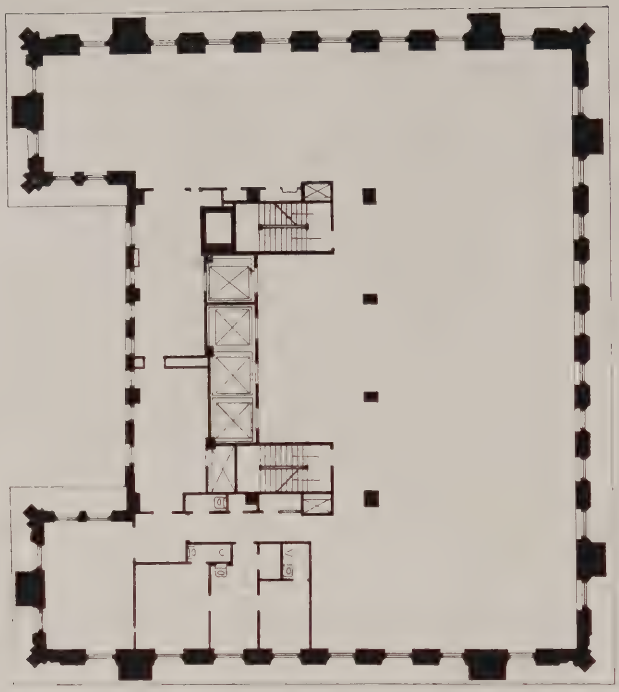
MEZZANINE FLOOR

PLANS. BUILDING FOR N. W. AYER & SON, INC., PHILADELPHIA
RALPH B. BENCKER, ARCHITECT

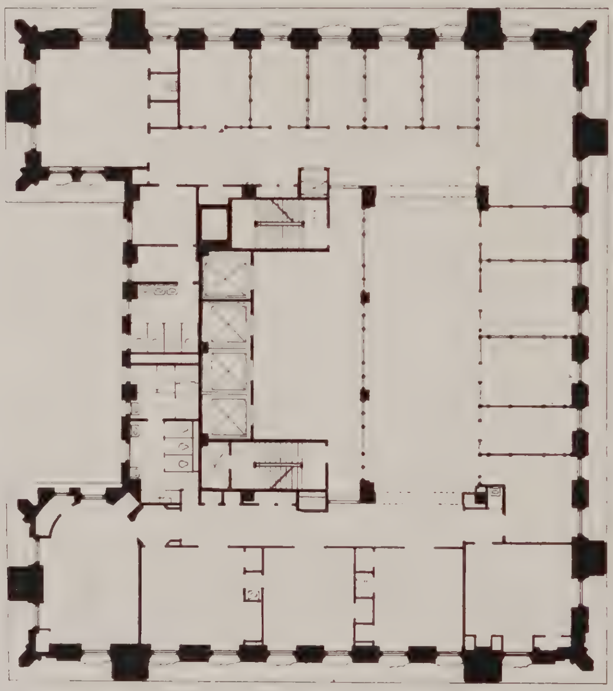


Plans on Back

MAIN ENTRANCE
BUILDING FOR N. W. AYER & SON, INC., PHILADELPHIA
RALPH B. BENCKER, ARCHITECT

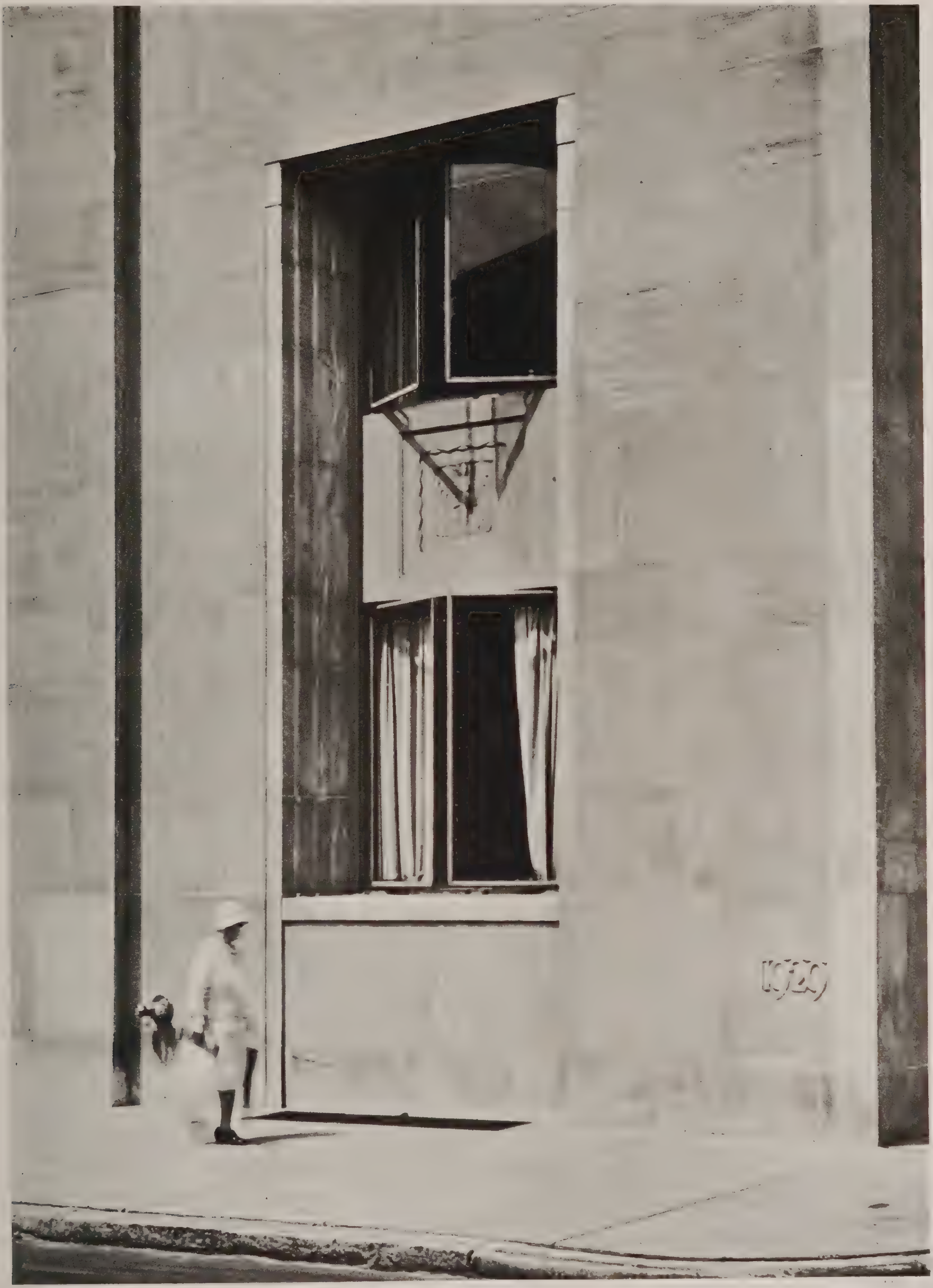


THIRTEENTH FLOOR

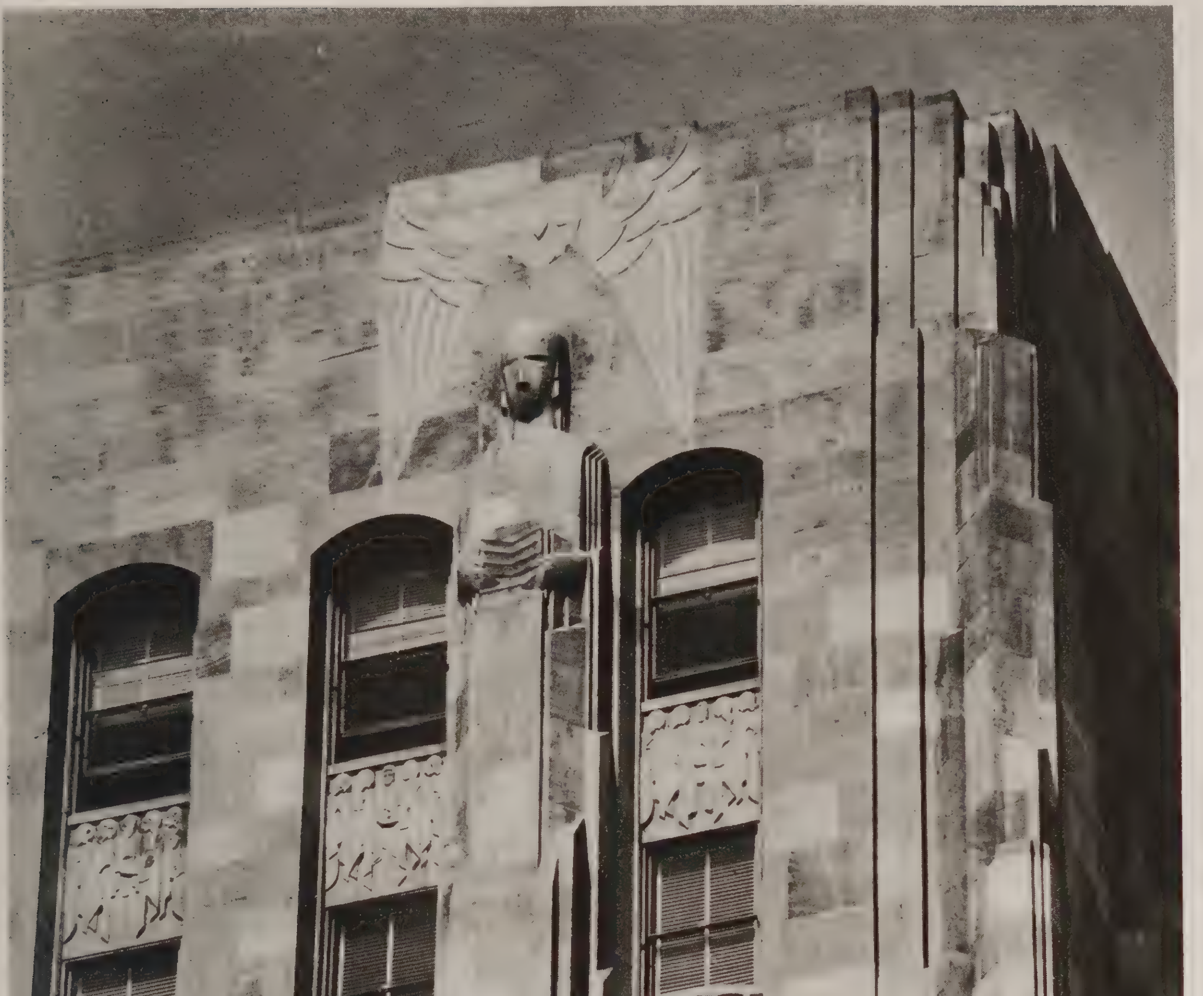


TWELFTH FLOOR

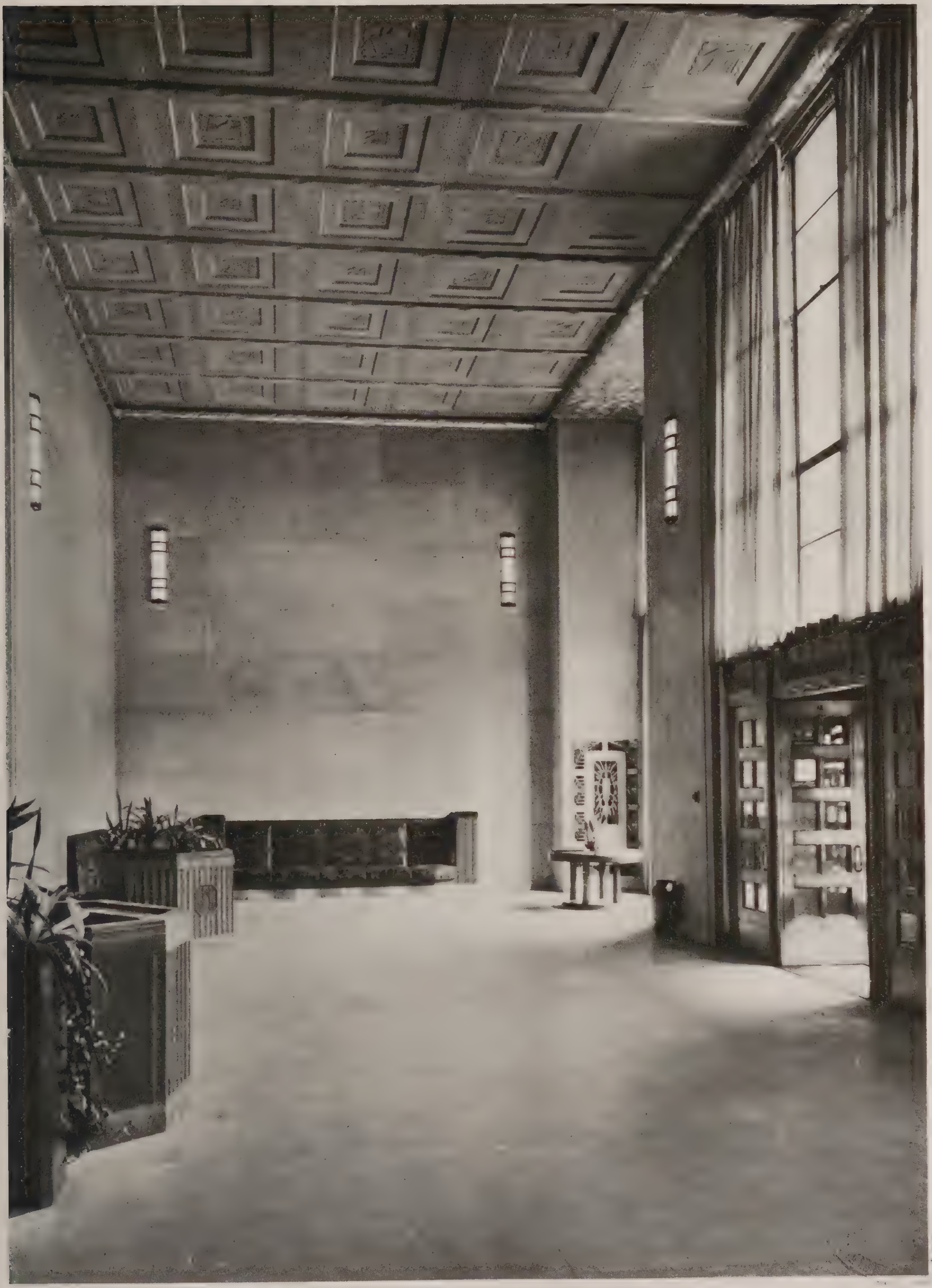
PLANS. BUILDING FOR N. W. AYER & SON, INC., PHILADELPHIA
RALPH B. BENCKER, ARCHITECT



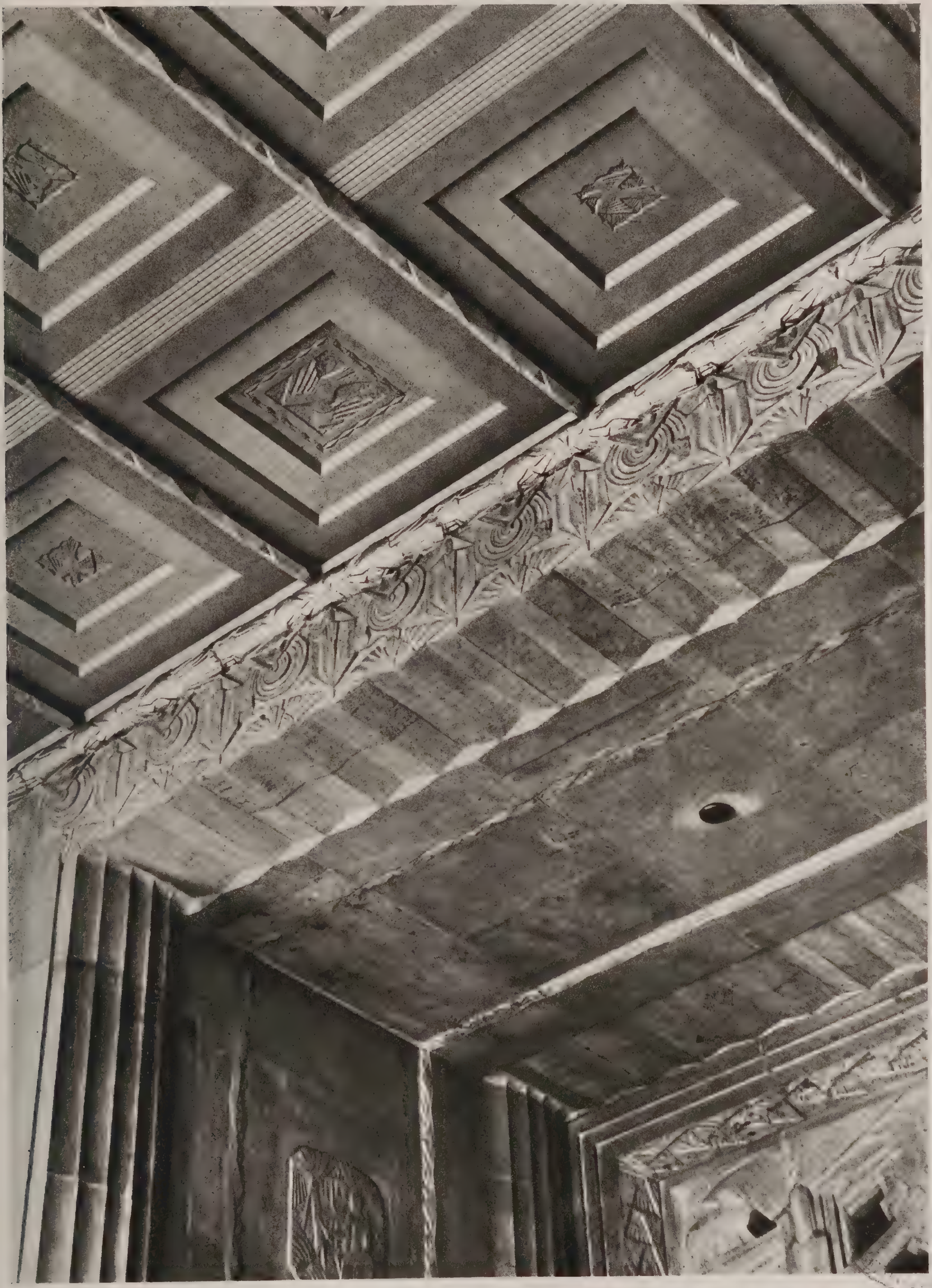
DETAIL, FRONT ELEVATION
BUILDING FOR N. W. AYER & SON, INC., PHILADELPHIA
RALPH B. BENCKER, ARCHITECT



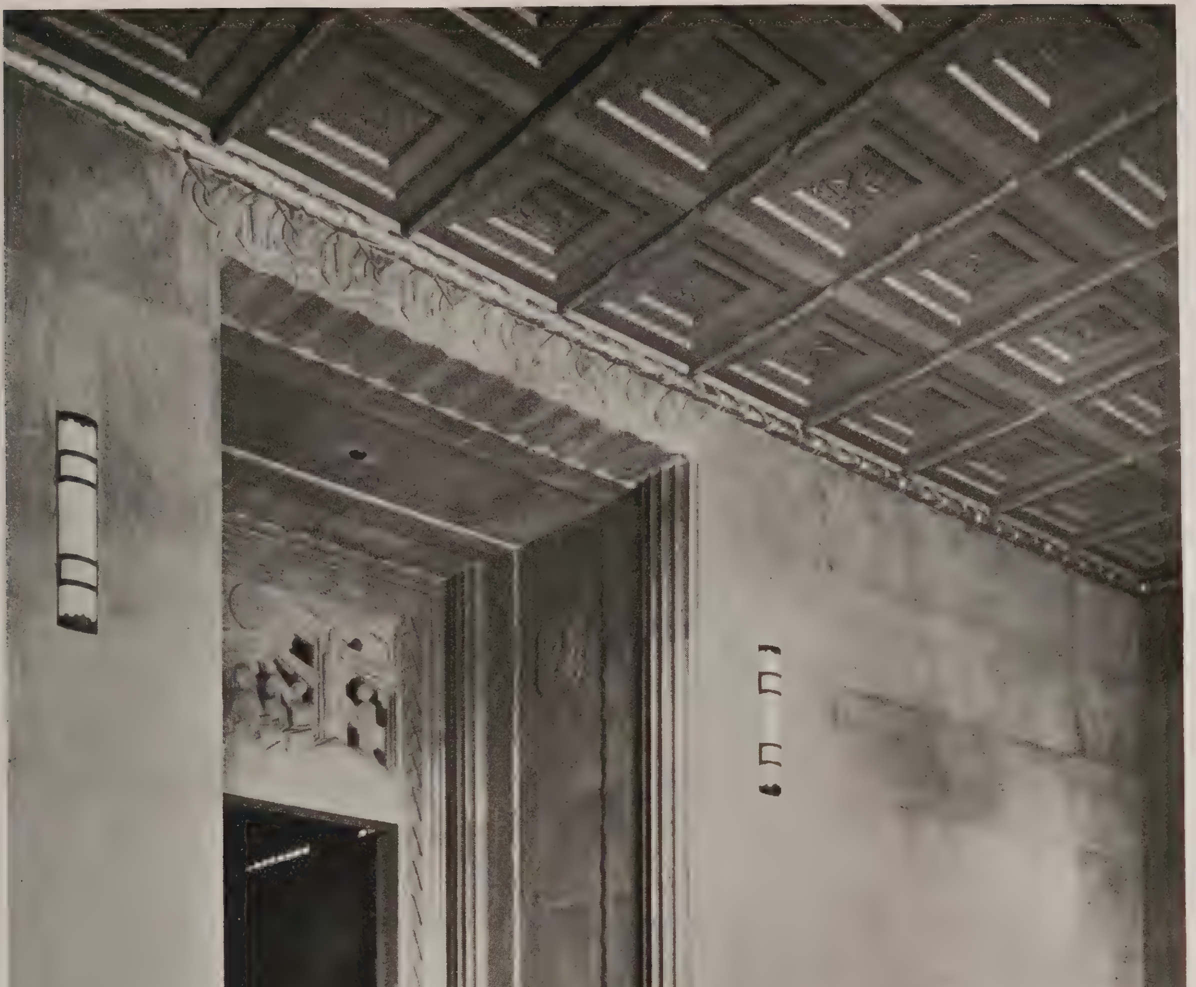
TOP OF BUILDING
BUILDING FOR N. W. AYER & SON, INC., PHILADELPHIA
RALPH B. BENCKER, ARCHITECT



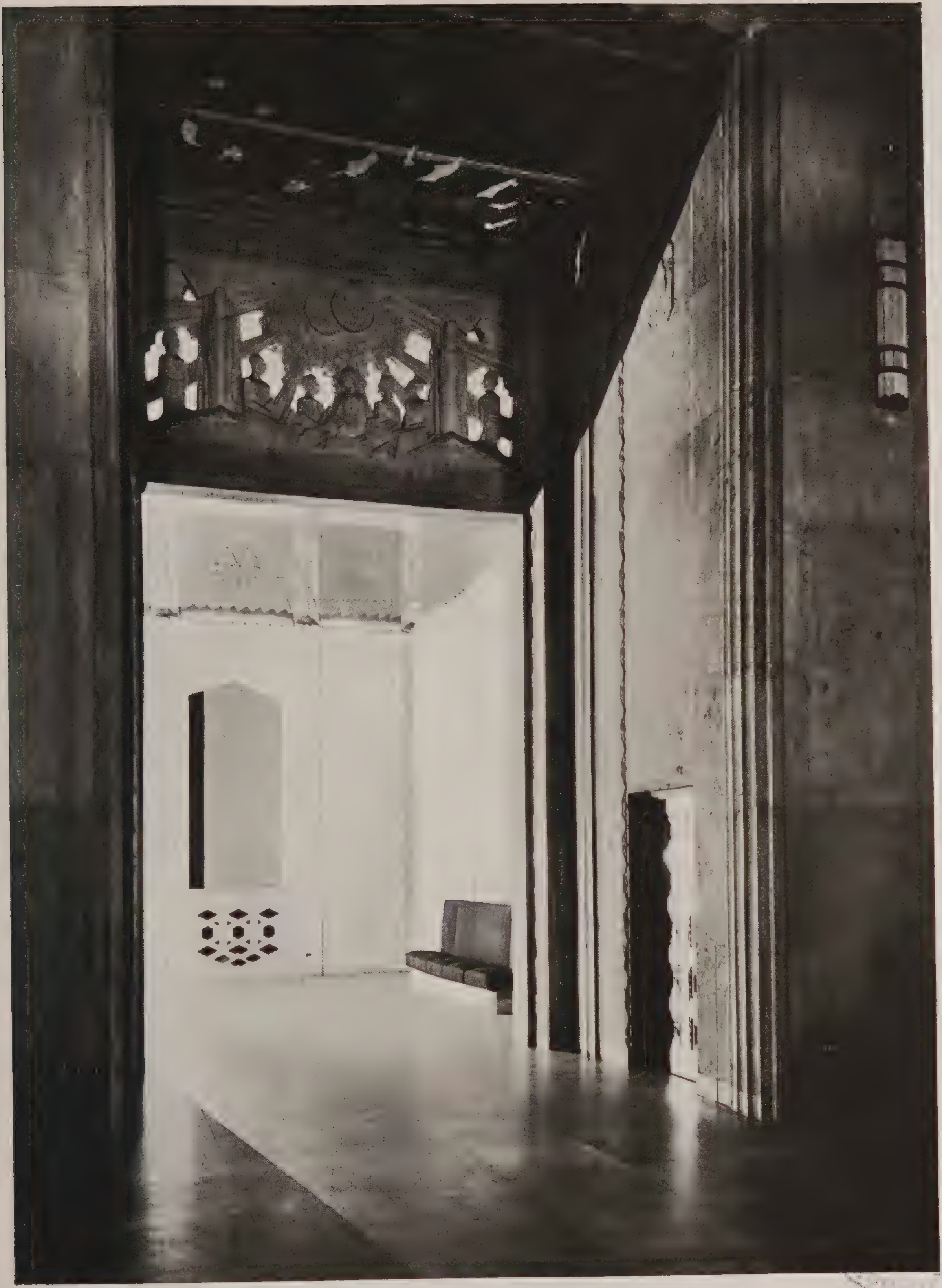
MAIN LOBBY
BUILDING FOR N. W. AYER & SON, INC., PHILADELPHIA
RALPH B. BENCKER, ARCHITECT



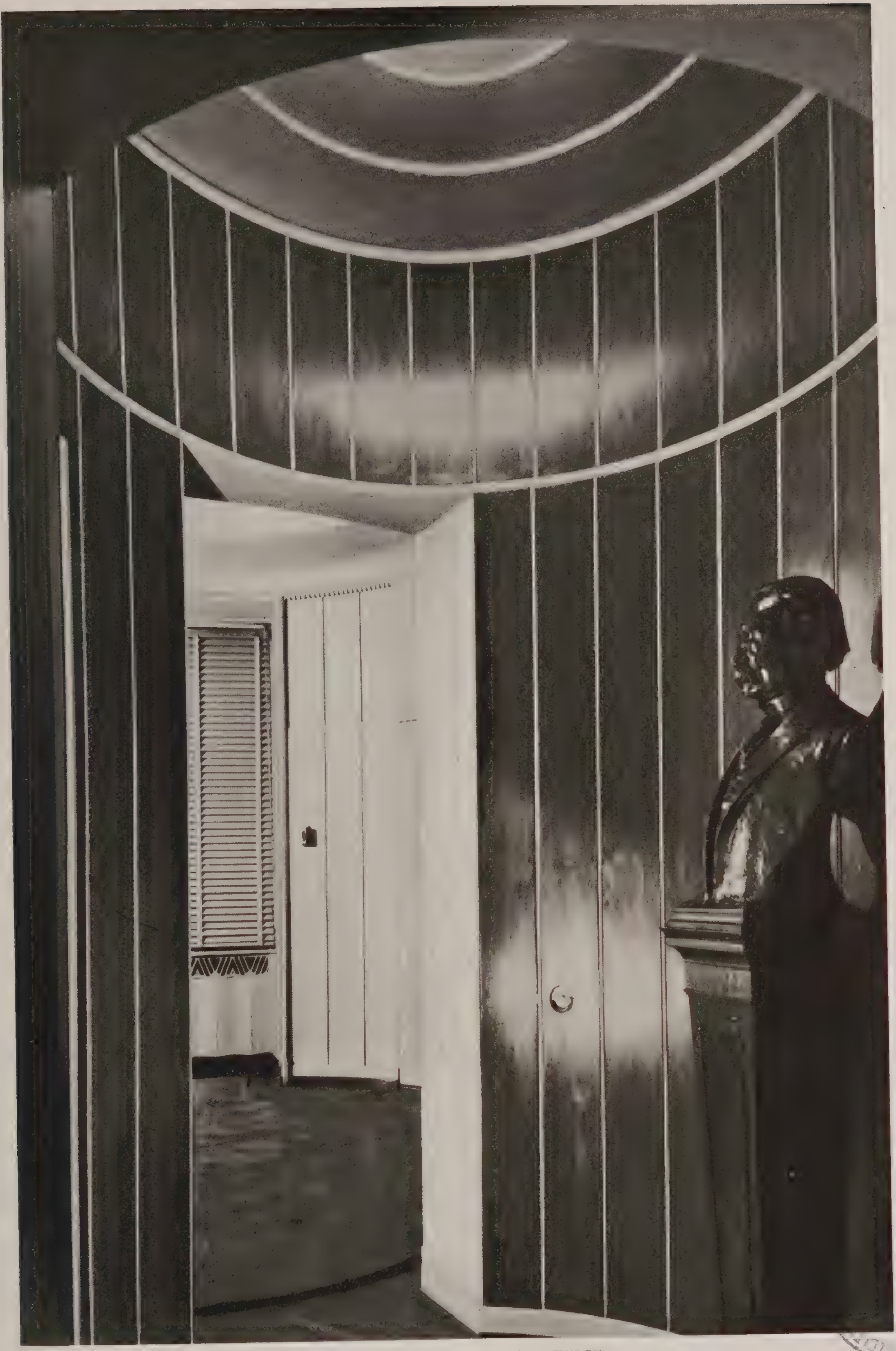
CEILING, MAIN LOBBY
BUILDING FOR N. W. AYER & SON, INC., PHILADELPHIA
RALPH B. BENCKER, ARCHITECT



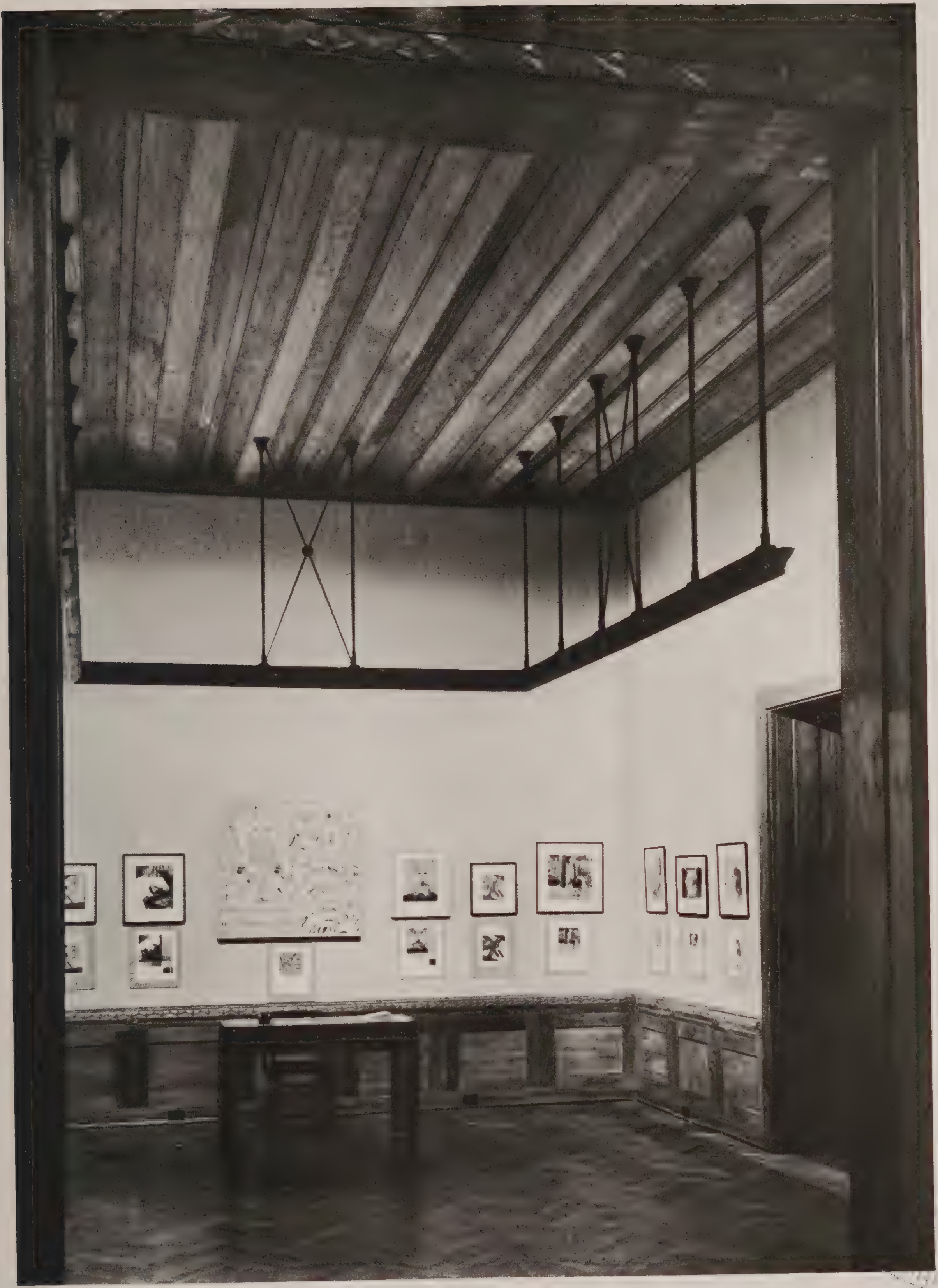
DOORWAY IN LOBBY
BUILDING FOR N. W. AYER & SON, INC., PHILADELPHIA
RALPH B. BENCKER, ARCHITECT



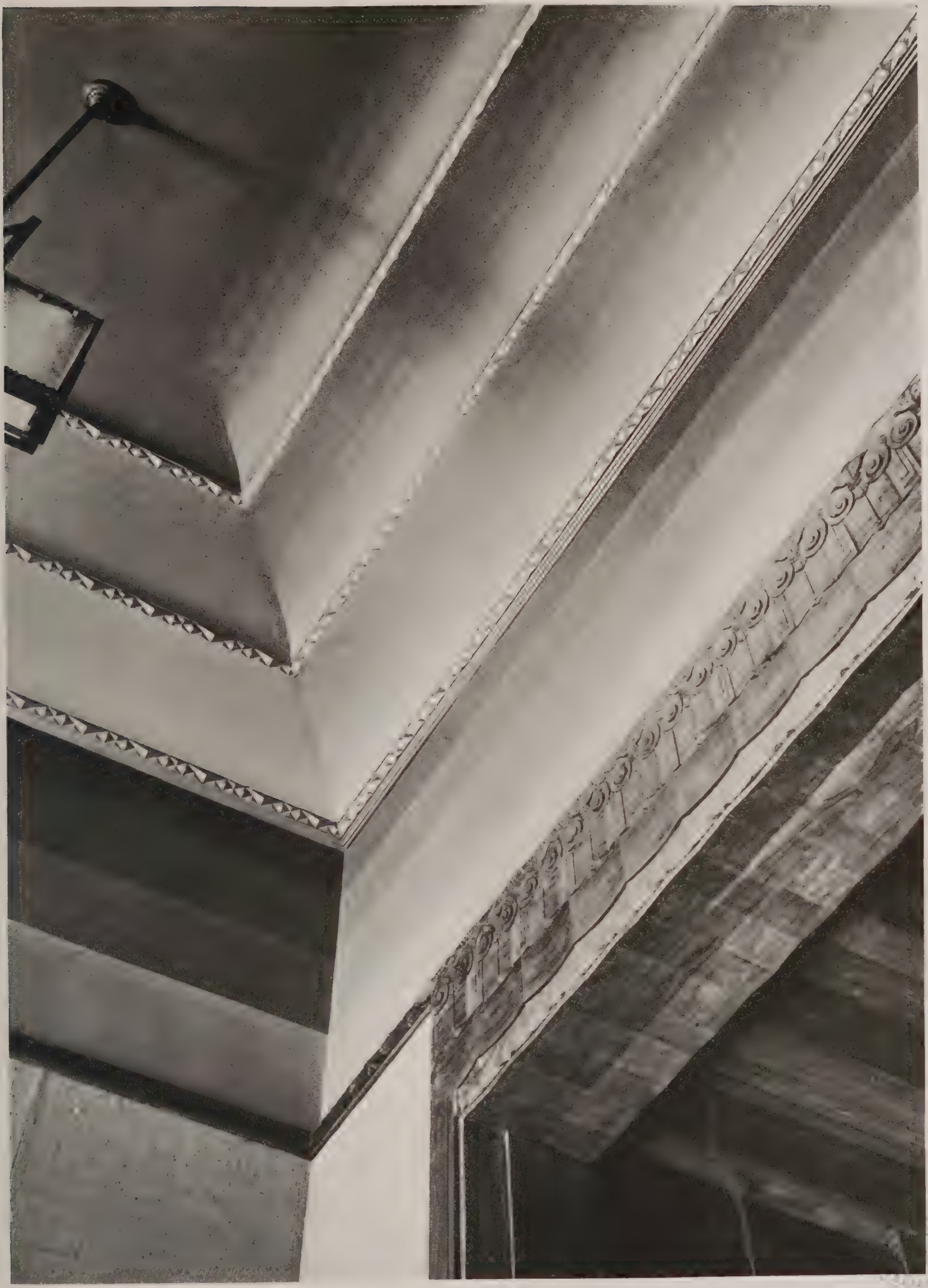
ENTRANCE TO ELEVATOR LOBBY
BUILDING FOR N. W. AYER & SON, INC., PHILADELPHIA
RALPH B. BENCKER, ARCHITECT



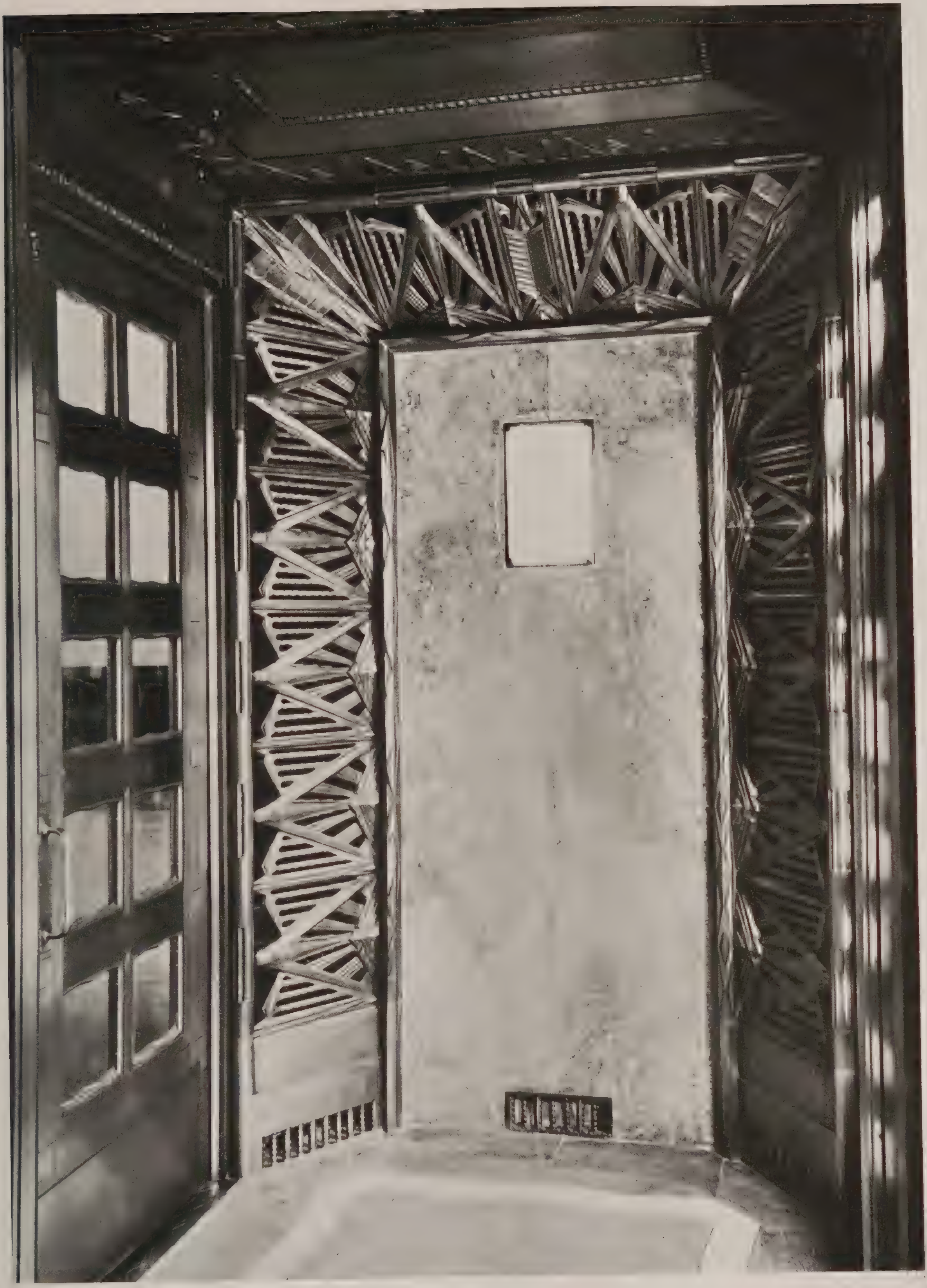
VESTIBULE, PRESIDENT'S OFFICE
BUILDING FOR N. W. AYER & SON, INC., PHILADELPHIA
RALPH B. BENCKER, ARCHITECT



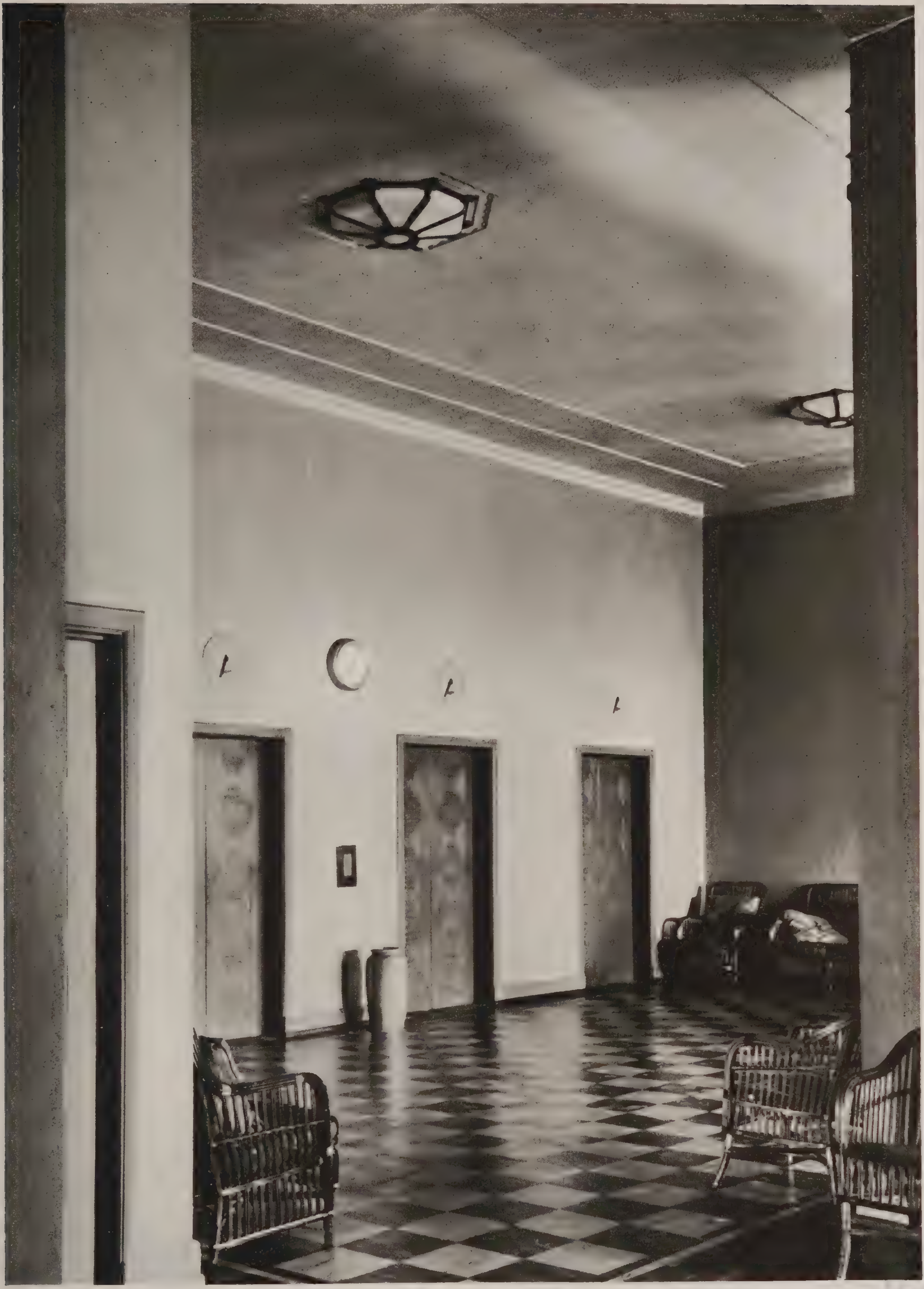
MIDDLE EXHIBITION ROOM, ART GALLERY
BUILDING FOR N. W. AYER & SON, INC., PHILADELPHIA
RALPH B. BENCKER, ARCHITECT



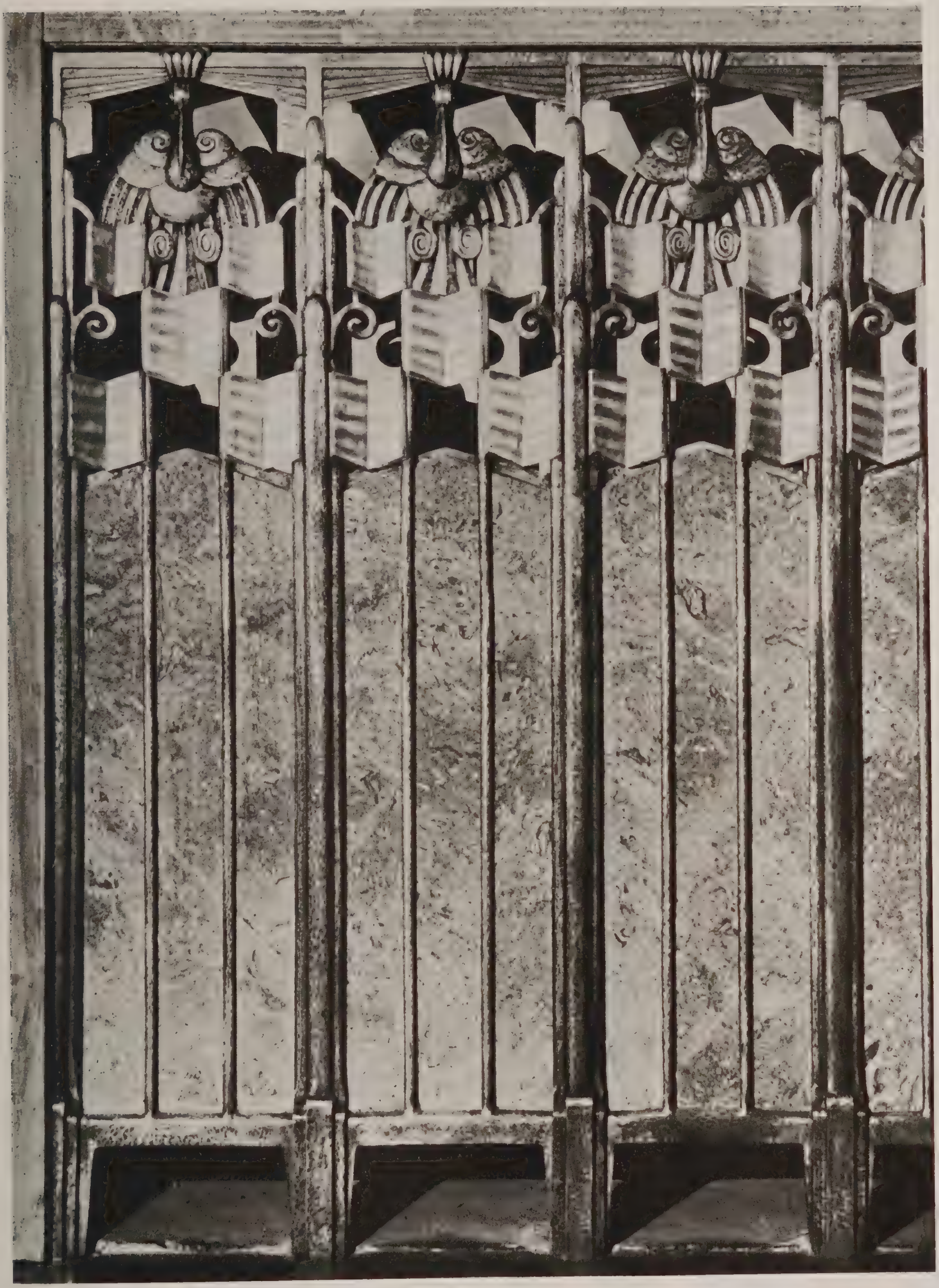
CEILING, MAIN EXHIBITION ROOM, ART GALLERY
BUILDING FOR N. W. AYER & SON, INC., PHILADELPHIA
RALPH B. BENCKER, ARCHITECT



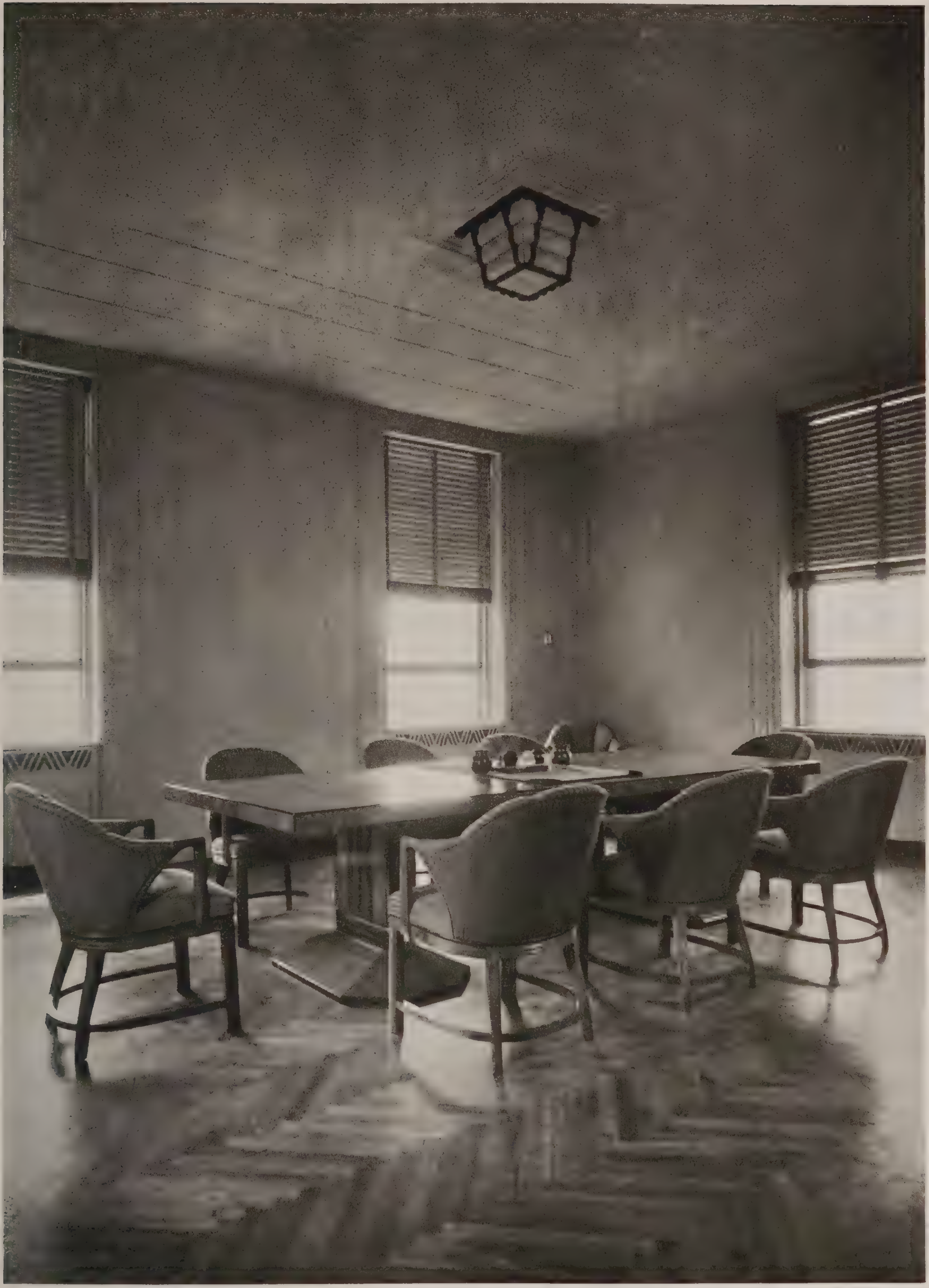
OUTER VESTIBULE
BUILDING FOR N. W. AYER & SON, INC., PHILADELPHIA
RALPH B. BENCKER, ARCHITECT



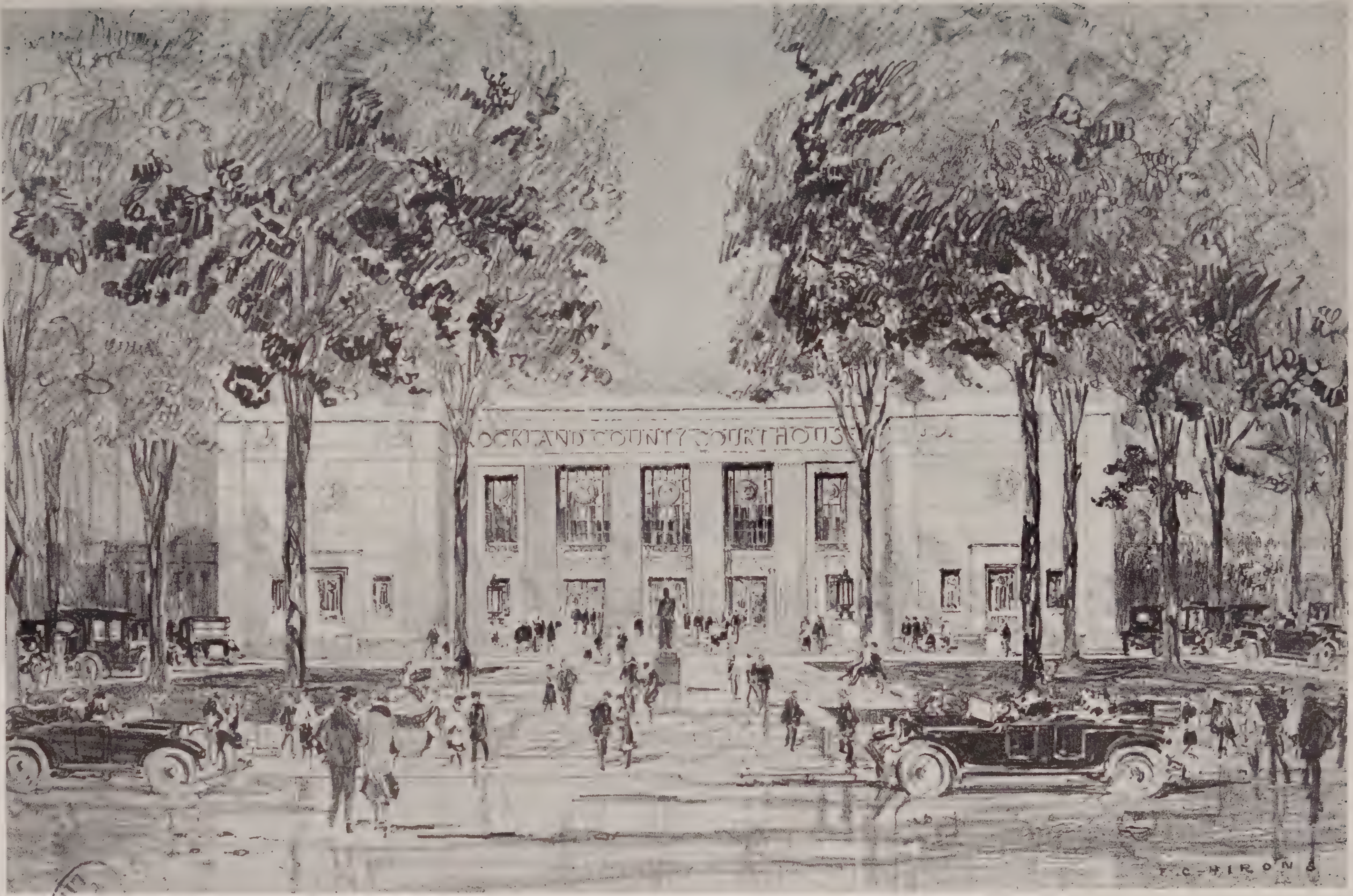
ELEVATOR LOBBY, CAFETERIA FLOOR
BUILDING FOR N. W. AYER & SON, INC., PHILADELPHIA
RALPH B. BENCKER, ARCHITECT



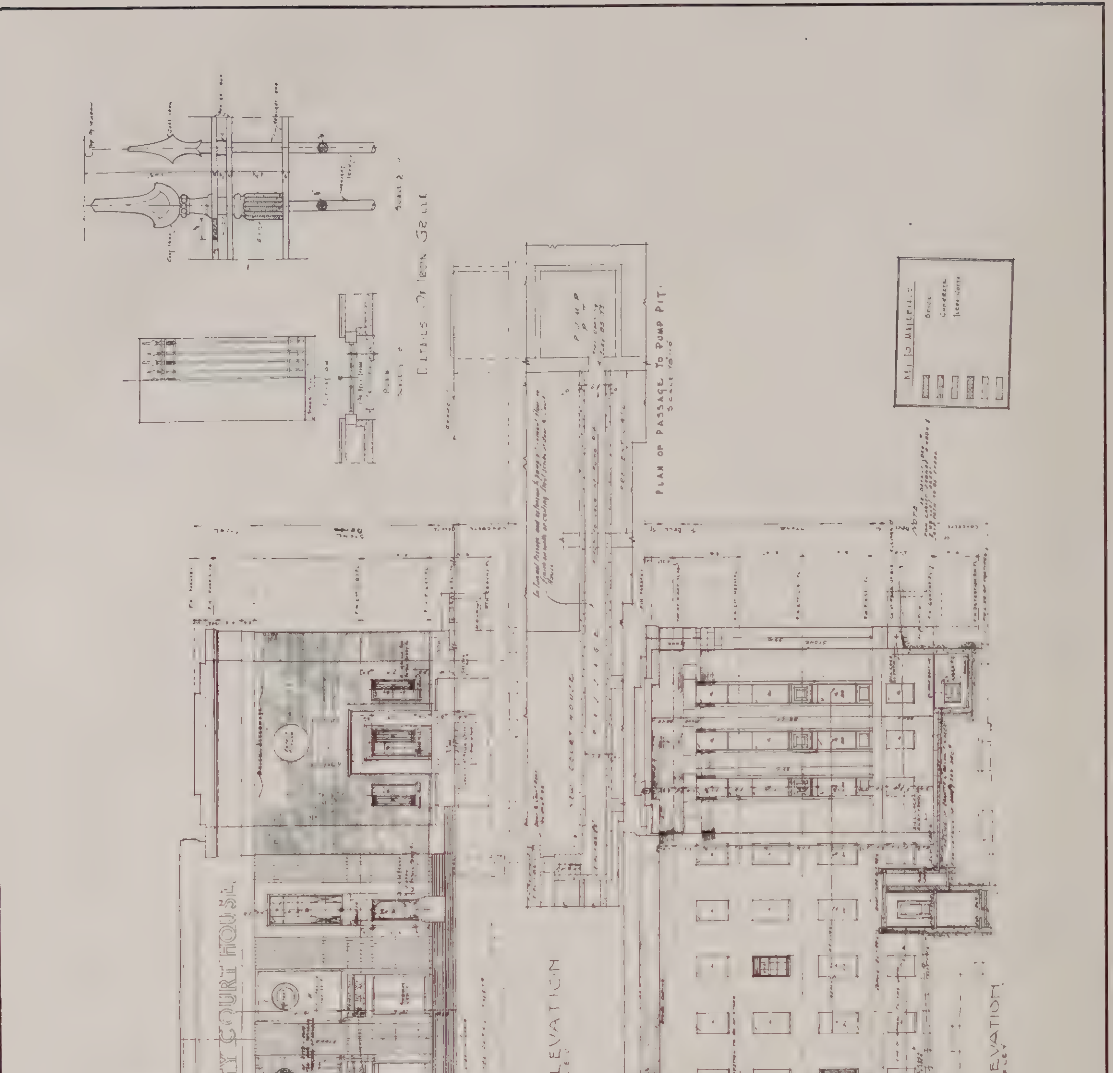
RADIATOR ENCLOSURE, ART GALLERY
BUILDING FOR N. W. AYER & SON, INC., PHILADELPHIA
RALPH B. BENCKER, ARCHITECT



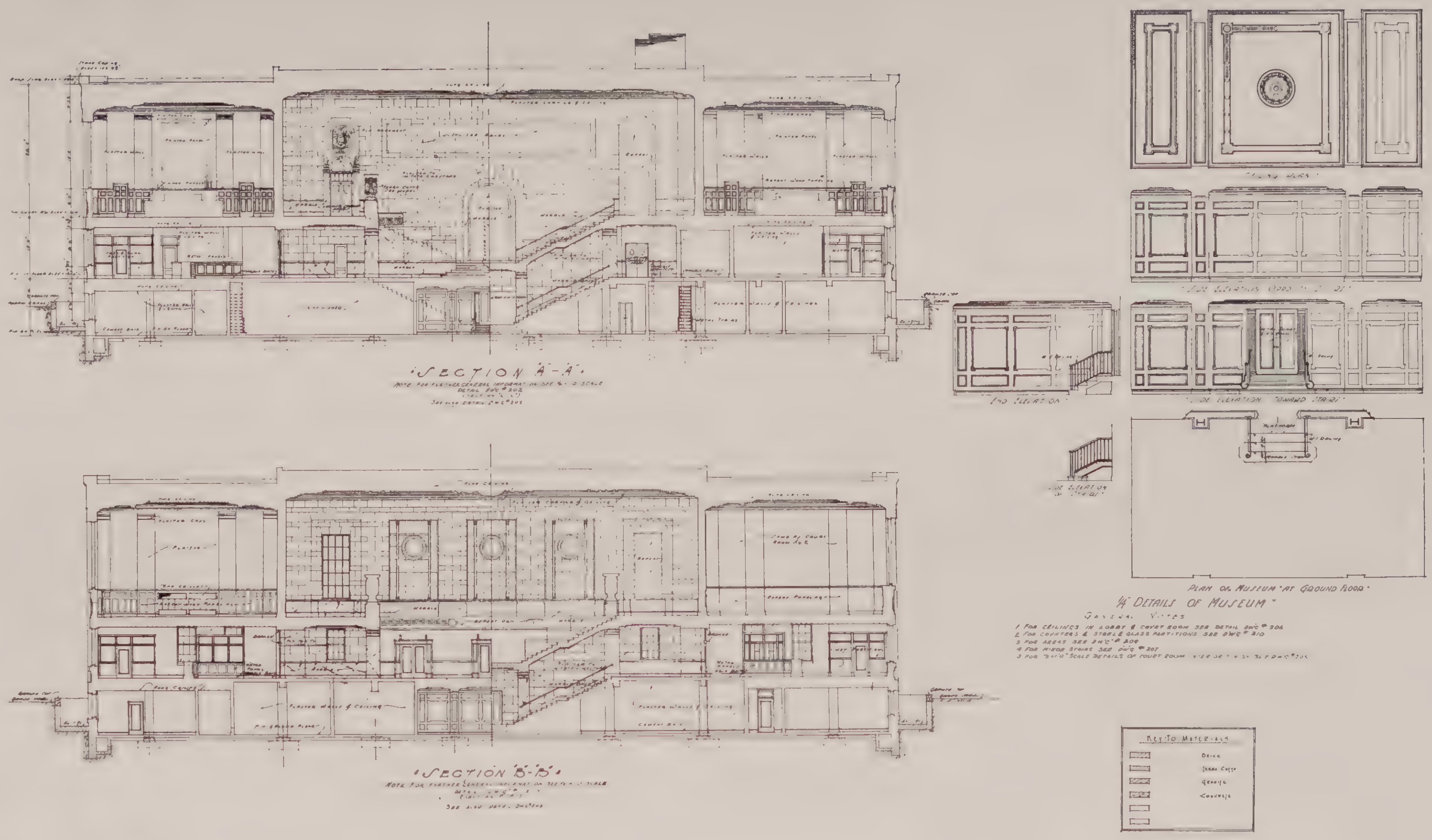
CONFERENCE ROOM
BUILDING FOR N. W. AYER & SON, INC., PHILADELPHIA
RALPH B. BENCKER, ARCHITECT



GENERAL VIEW
ROCKLAND COUNTY COURT HOUSE, NEW CITY, N. Y.
DENNISON & HIRONS, ARCHITECTS

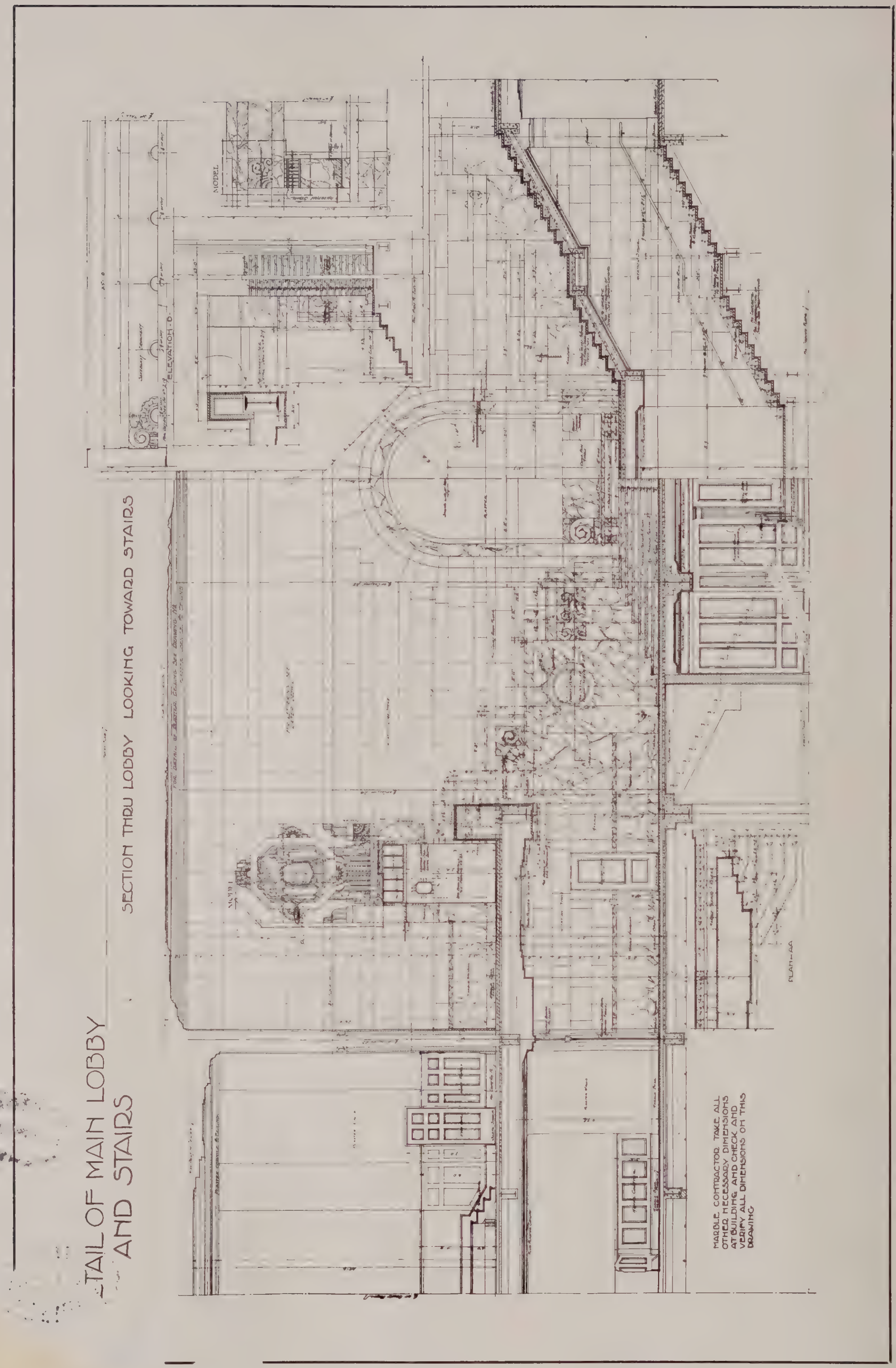


DETAILS. ROCKLAND COUNTY COURT HOUSE, NEW CITY, N. Y.
DENNISON & HIRONS, ARCHITECTS

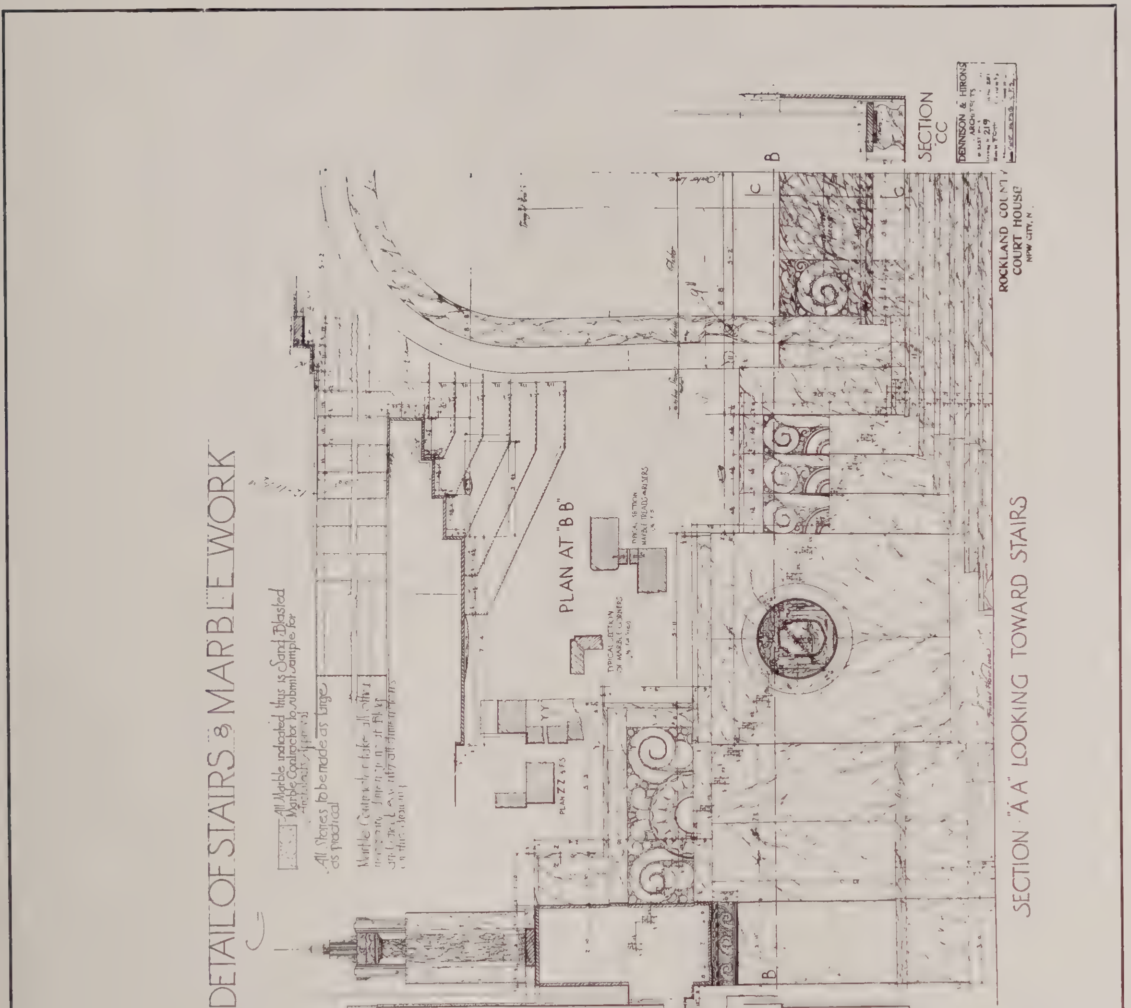

·SECTION 'A'-'A'·
NOTE FOR FURTHER GENERAL INFORMAT'ON SEE ¼" O SCALE
DETAIL DWG #202
See also Detail Dwg #303
·SECTION 'B'-'B'·
NOTE FOR FURTHER GENERAL INFORMAT'ON SEE ¼" SCALE
SEE ALSO DETAIL DWG
END ELEVATION
SIDE ELEVATION "GRAND STAIRS"
PLAN OF MUSEUM "AT GROUND FLOOR"
¼" DETAILS OF MUSEUM"
GENERAL NOTES
1 FOR CEILINGS IN LOBBY & COURT ROOM SEE DETAIL DWG #306
2 FOR COUNTERS & STEEL & GLASS PARTITIONS SEE DWG #310
3 FOR AREAS SEE DWG #209
4 FOR MINOR STAIRS SEE DWG #207
5 FOR "3'-0" SCALE DETAILS OF COURT ROOM
KEY TO MATERIALS
Brick
Terra Cotta
Granite
Concrete

DETAILS. ROCKLAND COUNTY COURT HOUSE, NEW CITY, N. Y.
DENNISON & HIRONS, ARCHITECTS

LIBRARY

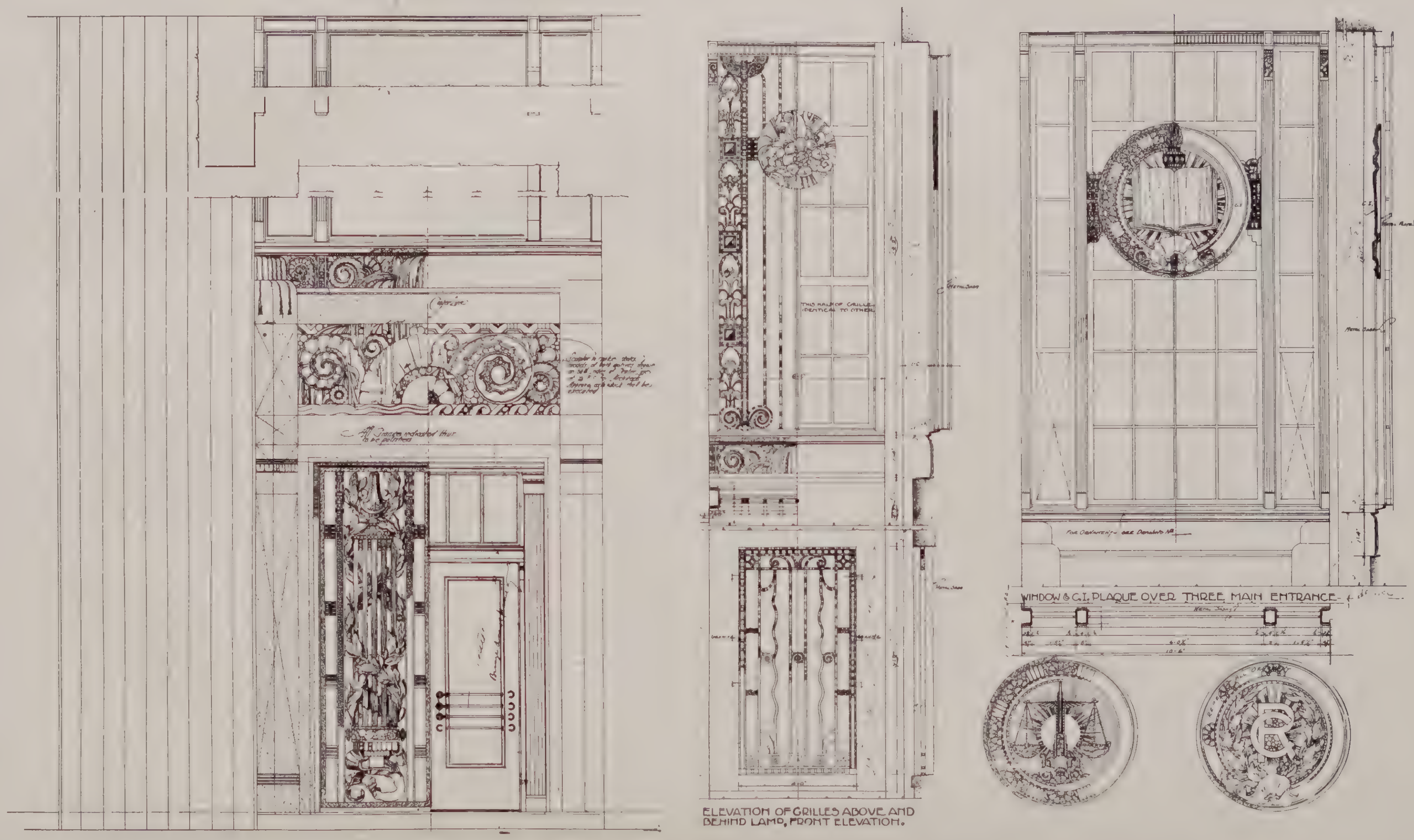

TAIL OF MAIN LOBBY AND STAIRS
SECTION THRU LOBBY LOOKING TOWARD STAIRS
ELEVATION D
MODEL
PLAN AA
MARBLE CONTRACTOR TAKE ALL OTHER NECESSARY DIMENSIONS AT BUILDING AND CHECK AND VERIFY ALL DIMENSIONS ON THIS DRAWING

DETAIL. ROCKLAND COUNTY COURT HOUSE, NEW CITY, N. Y.
DENNISON & HIRONS, ARCHITECTS


DETAIL OF STAIRS & MARBLE WORK
All Marble indicated thus is Sand Blasted
Marble Contractor to submit sample for Architect's approval
All Stones to be made as large as practical
PLAN AT "B B"
PLAN Z Z
Y Y
TYPICAL SECTION OF MARBLE CORNERS
PLAN OF LIGHT MOTIVE AT VARIOUS LEVELS
SECTION ON CENTER LINE
SECTION "A A" LOOKING TOWARD STAIRS
SECTION CC
A
B
C
DENNISON & HIRONS ARCHITECTS
ROCKLAND COUNTY COURT HOUSE NEW CITY, N.

DETAILS. ROCKLAND COUNTY COURT HOUSE, NEW CITY, N. Y.
DENNISON & HIRONS, ARCHITECTS

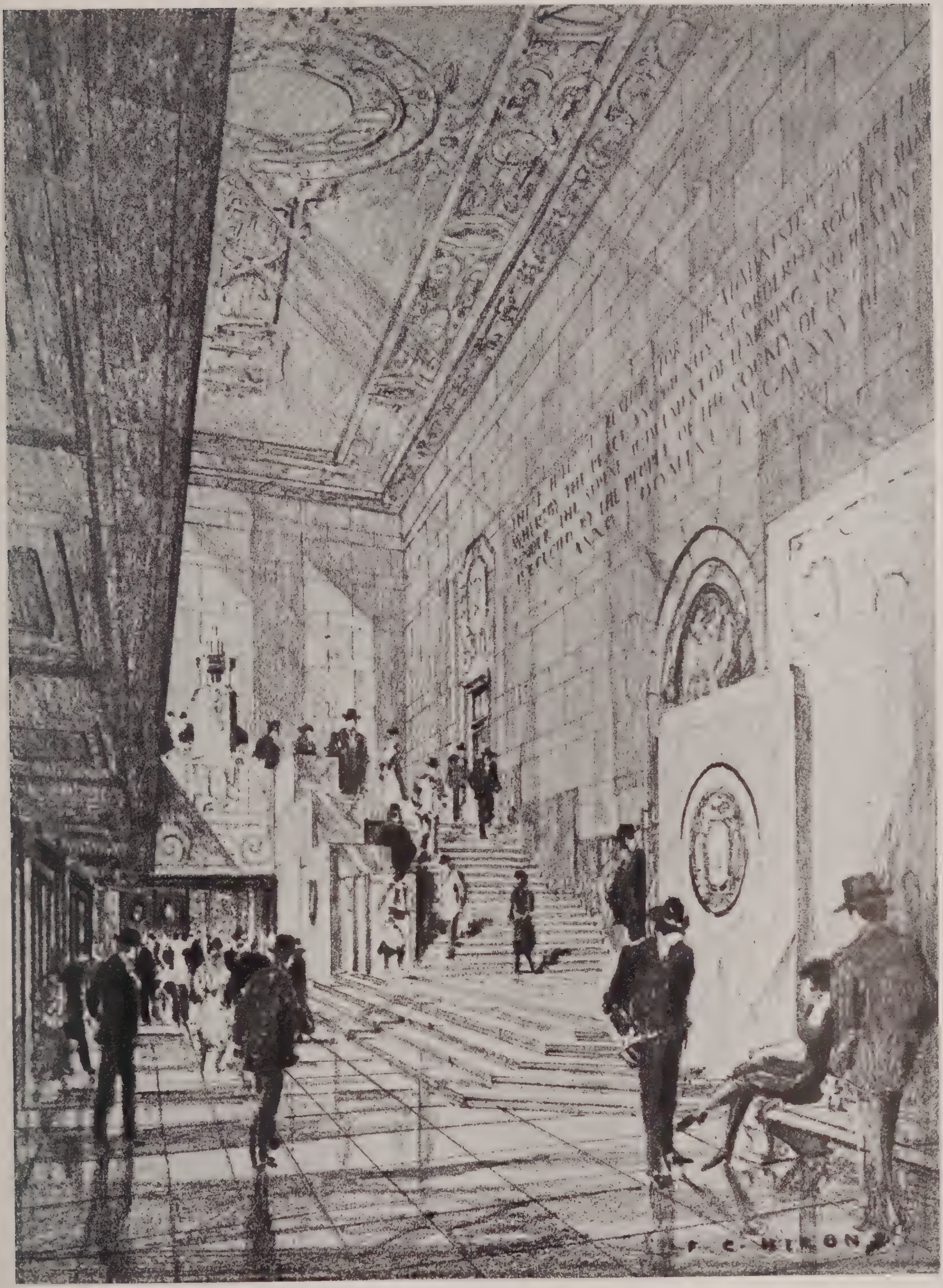
BOSTON PUBLIC LIBRARY


THIS HALF OF GRILLE IDENTICAL TO OTHER
WINDOW & C.I. PLAQUE OVER THREE MAIN ENTRANCE
ELEVATION OF GRILLES ABOVE AND BEHIND LAMP, FRONT ELEVATION.

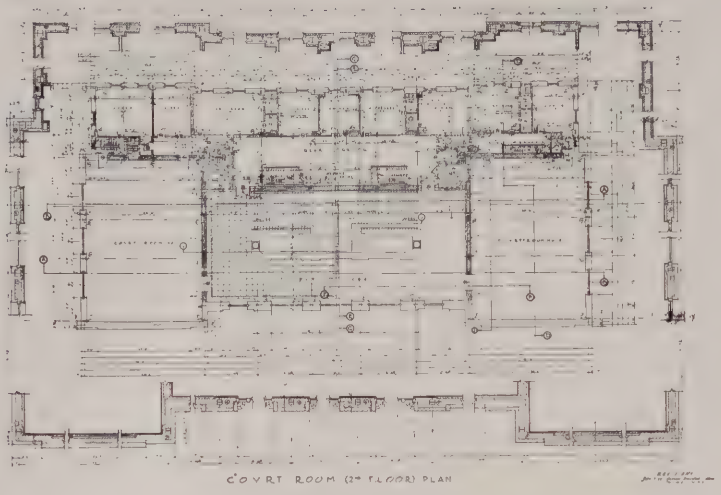
MAIN ENTRANCES, FRONT ELEVATION

GRILLES, WINDOW AND PLAQUE

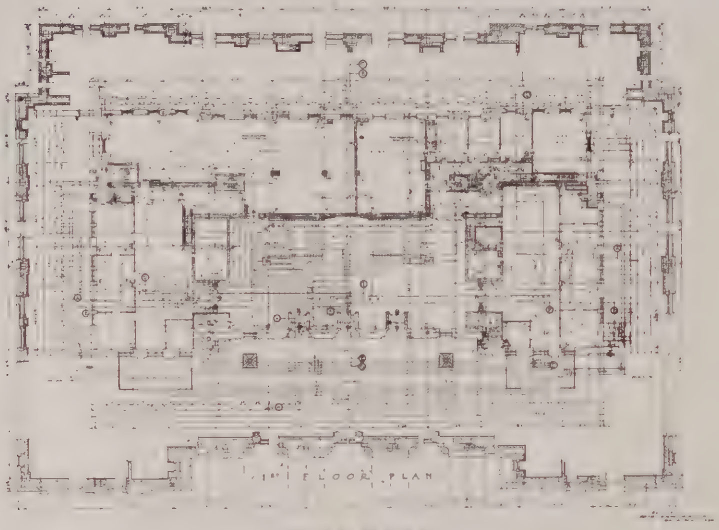
DETAILS. ROCKLAND COUNTY COURT HOUSE, NEW CITY, N. Y.
DENNISON & HIRONS, ARCHITECTS



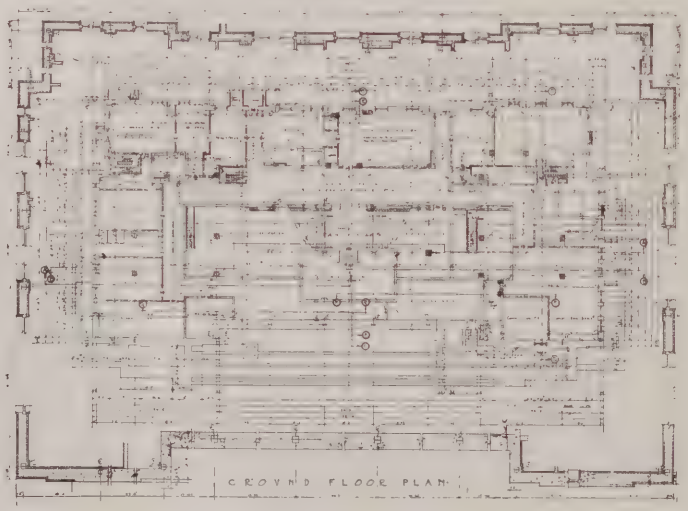
MAIN STAIRWAY
ROCKLAND COUNTY COURT HOUSE, NEW CITY, N. Y.
DENNISON & HIRONS, ARCHITECTS



SECOND FLOOR



FIRST FLOOR



GROUND FLOOR

PLANS. ROCKLAND COUNTY COURT HOUSE, NEW CITY, N. Y.
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SOME PRIORIES OF THE ELEVENTH AND TWELFTH CENTURIES

BY

MILTON D. LOWENSTEIN

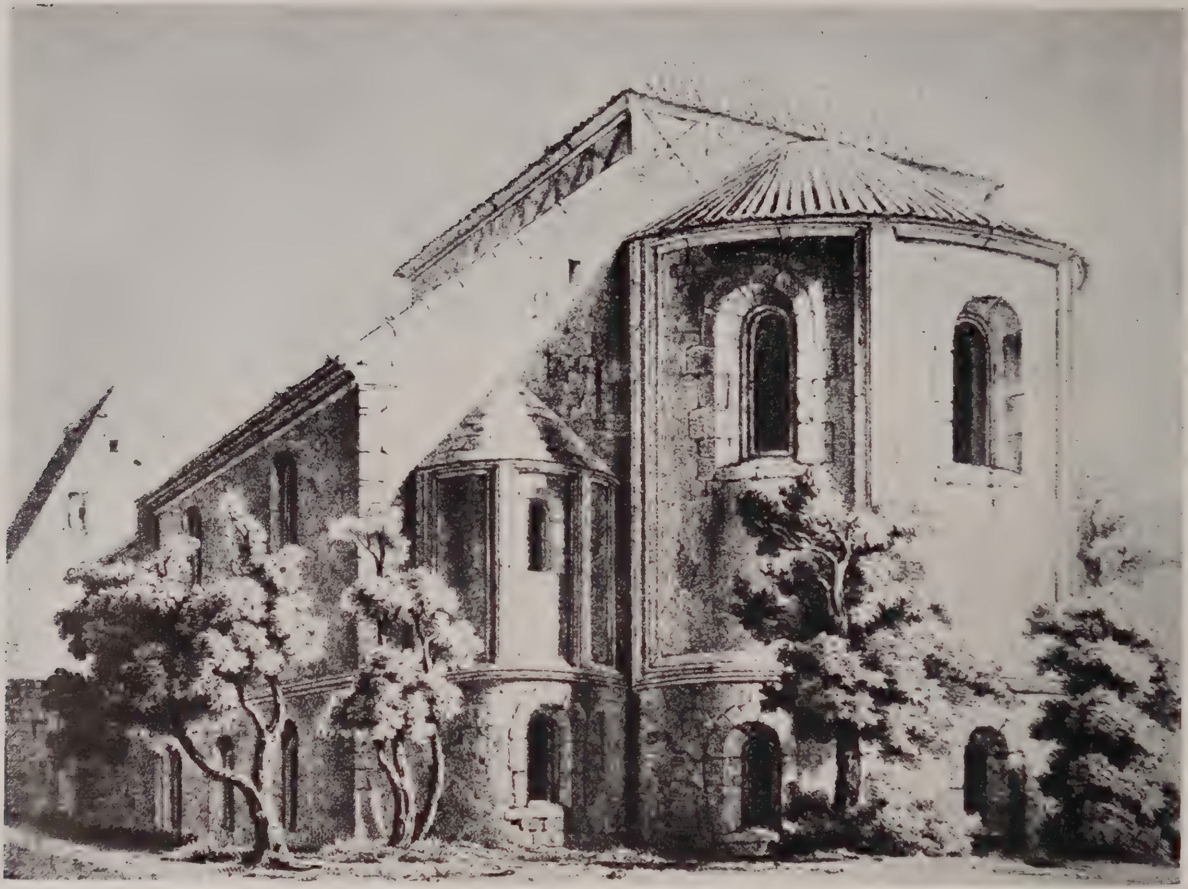
ARCHÆOLOGY includes the history of a craft as well as that of an art. We can see in architectural forms a picture of an age's actual civilization. The history of other arts is often a story of unrealized aspirations. Religion, literature, painting, sculpture and music anticipate a culture. They shun the mundane and present an ideal which often guides architecture but which is not its unique *raison d'etre*. Broken walls that have withstood the ages are remains of important ethical, social or political institutions. The physical environment of the time, the mental attitude of the people and their leaders, their rituals,—not to mention their building traditions,—are all inherently a part of architecture. The modern architect who stopped to concern himself with all the influences which contributed to the building he is designing would hopelessly destroy his genius. He may, however, analyze the intricacies of another age and bring to his own time, through his art, valuable correctives. There are a few architects who understand their age intuitively, but most artists feel at some time in their careers the need of identifying themselves with a tradition and a philosophy to which they can turn for guidance and inspiration.

Through fathoming the spirit that motivated mediæval architecture, I had hoped to learn not so much that which is scholastically known as "Gothic" style as to grasp the significance of self-expression. All mediæval ruins held me enthralled when I first went to Europe. It made little difference whether it were a castle in England or a church in France,—anything which had been built between the eleventh and fifteenth centuries was a subject for study. It seemed that during this period there was fostered in all men the desire for artistic creation. In attempting to follow the example of the Creator, men in their small but nevertheless exquisite way endowed material with rare beauty. Eventually my attention narrowed down to small priories or isolated monasteries. Unlike a blatant feudal castle or a gaudy cathedral, the priory seemed to me then to constitute a living entity,—aloof, independent of life's amenities as it guarded the sacred flame of humanity from the fitful storms that swept ceaselessly over Europe. It stood for things that antedated Christianity, and it included all that was permanent and useful in western culture. Only an unsympathetic eye could behold it merely as the offspring of an omniparent basilica impregnated with oriental philosophy. The priory had less interest for me as a building than as an expression of ideals common to pagan, Jew and Christian, expressions which transient forces may obscure but which they can never obliterate.

While the Semitic tribes were wanderers, a portable Tabernacle served as a rallying place where personal succor was sought through collective intervention. When the fertile river valleys tempted the tribes to settle and build cities, there was need of law courts, houses of assembly and fortresses. The Tabernacle took over these secular functions, since it was the only place where community life had ever existed for the tribe. Similarly, the secluded citadel of pre-Christian times developed into the pagan temple when organized war for communal rights took the place of spasmodic marauding for selfish gain. The temple served as a symbol of union and as a common treasury for the more gregarious tribes against a barbaric enemy. The offerings made by individuals added to the community's benefits. The beginnings of the priory cannot be dissociated from these influences. To the idea of external propitiation of one kind or another, Christianity, through the examples of the Fathers, had suggested the possibilities of self-abnegation as a corrective for the ills besetting a sedentary civilization. But incessant warfare prevented any common endeavor or spiritual coherence. Wherever the conqueror destroyed, he rebuilt according to his own habits, as heedless of the work he demolished as he was of the brotherhood of man. Until the crusades each community interpreted St. Paul according to provincial contingencies, and church architecture was a local problem with local traditions. Still, in each priory the original, common Christian ideal was maintained unaltered.

Did the disappearance of monastic institutions imply the loss of the culture we associate with them? Or do its peculiarities form a fundamental part of human nature which has found architectural expression in other organizations?

The priory at Moret-sur-Loing had long ago been abandoned as a tannery storeroom when I first saw a corner of its well knit rubble stone wall projecting into the road. I had been sketching in the town cathedral, when a priest showed me an old print of Moret. He told me the story of its ancient glory and sad decline, and among other monuments which he said had disappeared was the Prieure de Pontloup. As I pushed open the battered wooden door, I realized that I was standing amid the ruins of the old church. After weeks of measuring and study, I completed the



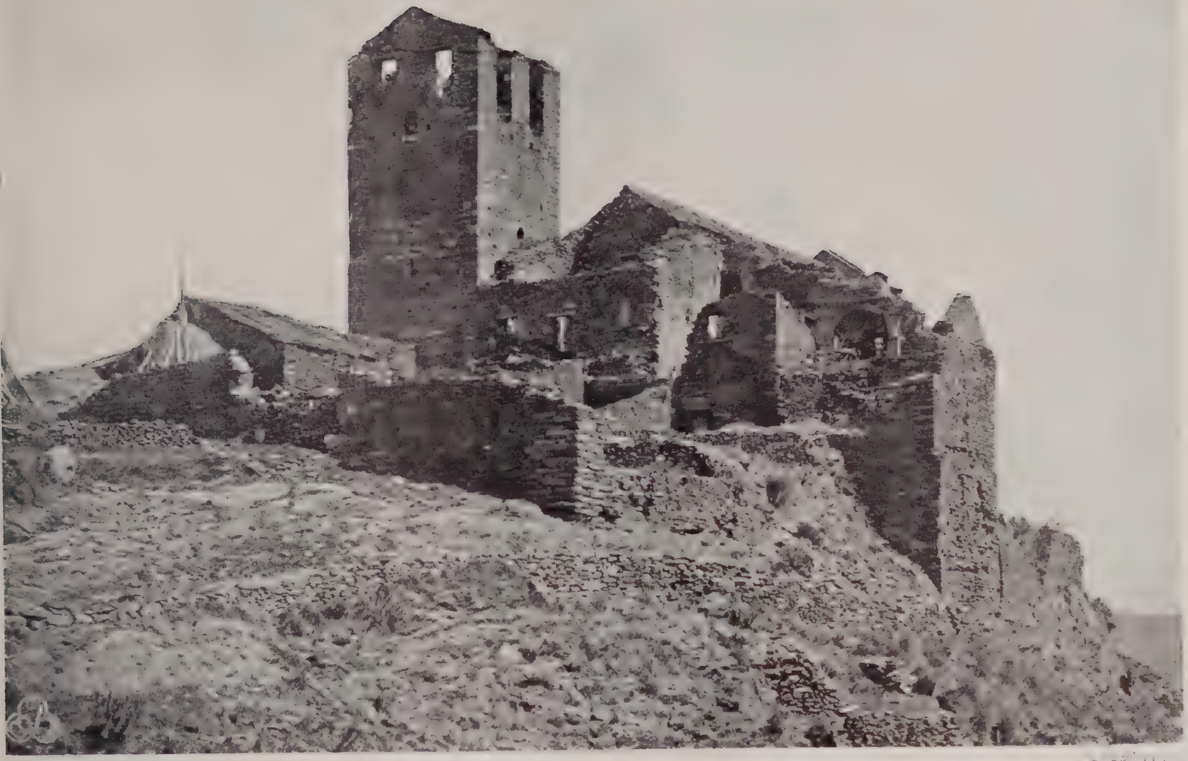
The Priory at Konradsburg, from an Old Print

drawings for the restored building. This study led me into an investigation of asceticism and particularly of the lives of such men as Simeon Stylites and Benedict of Nursia. They were not the first to lift themselves above the senseless turmoil of the time. A thousand years before them Pythagoras adopted the same attitude. Then there had been the Essenes in Judæa and the Therapeutæ of Egypt.

With the founding of the Order of St. Benedict, asceticism became comprehensible to people who had regarded it with superstition or covert ridicule. A new plane of existence was revealed, an encompassing world where citizenship was based not upon tribe, nation or religion but upon a transcendent quality peculiar to the vigorous and the young. It took all of Benedict's genius to perpetuate this quality. Until his time there was no established "rule;" each group of ascetics had lived according to what seemed proper to the conditions of the time and place, but by the end of the eighth century St. Benedict's rule was known over all of western Europe. A code of 73 chapters described minutely and yet briefly the Order's life of silence, humility and obedience.

St. Benedict sought to keep the energies of his organization confined to purposes exalted enough to encompass everything worth while in life, and yet so limited as to prevent its being racked by the struggle of internecine forces. When Pope Urban II directed the eyes of Christendom to the Holy Land, many petty strifes were absorbed by the imminent single struggle. While the fiery zeal of men like St. Bernard, representatives of the one stable traditional element in Christianity, awakened the multitudes, the monasteries supplied a neutral meeting place for the allies. A fragmented society learned to appreciate the company of its neighbors in assembly and at prayers,—not to mention in times of war.

The monk took three vows. 1. *Stability;* he bound himself forever to the monastic family. 2. *Conversion;* he renounced the three concupiscences. 3. *Obedience;* the monk subjected his will to the command of a superior. Unceasing prayer kept the monk reminded of his vows and offset the temptations of self-indulgence by the refreshing experience of shared lofty emotions. People of the surrounding country joined in the more simple and obvious forms. Mass, sometimes held out of doors, like Grace dignified the day of crude physical activity and self-emolument. Monastic



Ruins of the Priory at Serabonne

labor included all the activities that took place in a small city of the time, without the arrogance which usually accompanies individual accomplishment. The monks tilled the soil, learned trades, engaged in commerce and took part in the controversies that developed from all this work. The joy of labor, having replaced the pride of achievement, demanded a form of expression. "The laborer holding the handle of the plow shall chant alleluia; the reaper drenched in sweat shall walk along singing psalms; and while the vinedresser prunes the backbent vinestock with his sickle, he shall mumble King David's psalms." (Dom Martene. *De antiquis monachorum ritibus*). Whether rendered in set old phrases, in stone or with paint, the melody transmuted the crude material into a complement of the moment's joy. The priories, built in many instances by the monks themselves, are the most eloquent examples of this abandonment to the pleasure of workmanship and also monuments to worthy construction.

The capitals and balcony carvings in the priory of Serabonne are incomparable examples of monastic art. I came upon this little church while studying the work at St. Michael de Cuxa in the Pyrenees mountains. Accessible only by way of a mountain path, the priory is hardly known. I thought at first I would make only a few sketches of the sculpture, but I became so fascinated with this marvelous gem, set amid the bleak ranges, that I decided to make a study of the entire building. "If it should happen that a brother is enjoined with a difficult or even an impossible task, he must receive the command given him in all meekness and obedience." (*Reg, S. Bened. clxviii*). As there was no hotel within several miles, I lived in the priory, using an old coffin filled with straw as a bed. A kitchen was constructed in one of the subterranean vaults which had partially fallen through. I was reminded that food and drink supplied a sensual attraction to the novice which the monotonous tone of the "reader" in the refectory could not always succeed in overcoming when a young monk's appetite was sharpened in the keen mountain air! Benedict believed that punishment deprives the erring one of dominion over his own worldly life; that it wrests from man the noble dignity which comes from a consciousness that his soul, which he identifies with his Creator, is sole arbiter of his fate. But the compensatory nature of a man's acts, and in the case of evil their retributary character, also thwart this dominion. Through submission to a superior and through confession, the monk sought to preserve the best part of himself and to continue in that state of grace necessary for a happy earthly existence.

The following year, accompanied by my father, I sought another example of a priory, in Germany. Near the town of Ermsleben, in the Hartz mountains, we found the remains of a twelfth century church built into an old feudal estate known as Konradsburg. The tenants seemed to be living under conditions far worse than those said to have been prevalent seven centuries ago. As we measured and sketched the ruins we obtained an unusually good picture of peasant life, and we heard those strange stories which often make the past seem far away, but which in our situation made the ancient plots live again.

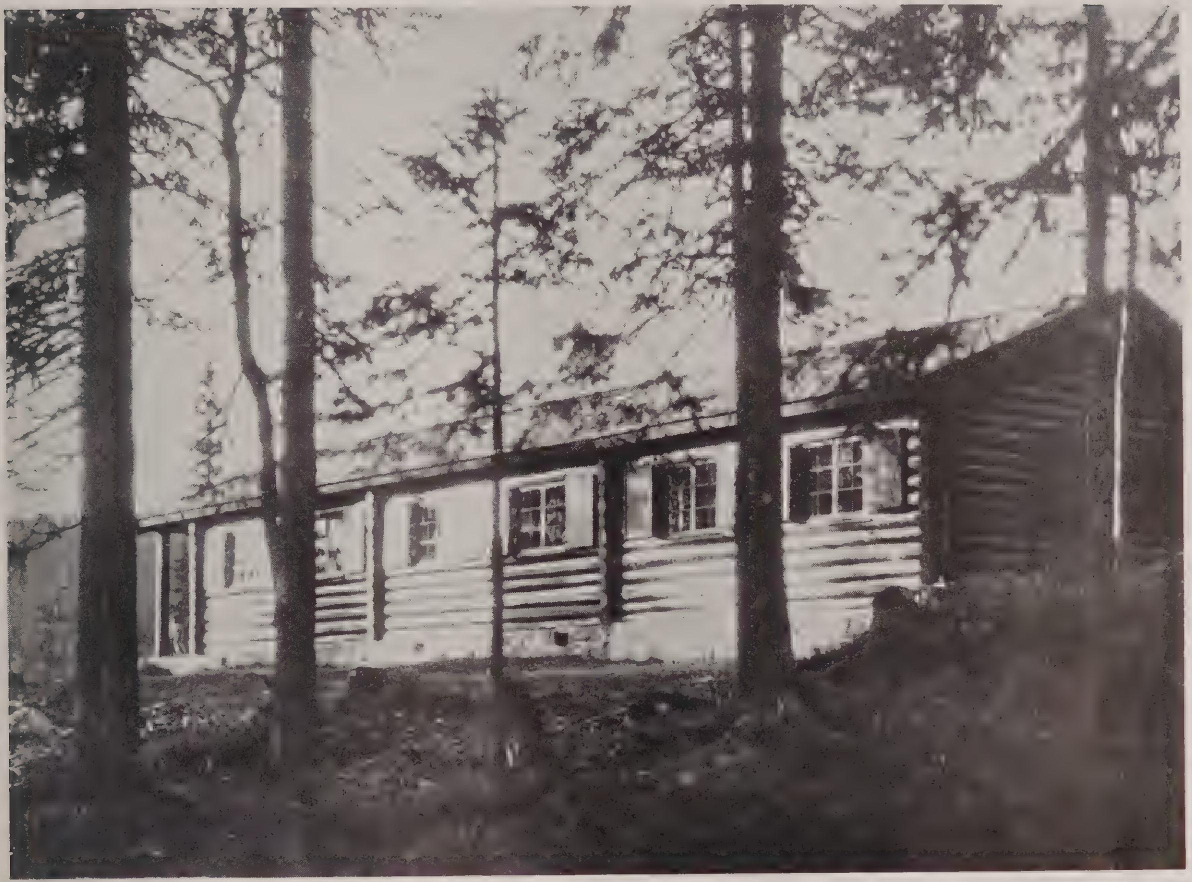
Refining the technique of living is reserved for sensitive natures, who, possessing many resources, will exploit them only for a transcendent purpose. In general this means a renunciation of the greatest portion of life and, to the ordinary man, annihilation itself. Then there comes a Paul, a Bernard, or a Joan, who, by thwarting their own hidden nature, change the contemporary tendencies and bring to a focus within themselves the surging inchoate forces of a new existence for men.

In the twelfth and thirteenth centuries that part of Spain not subjected to the Moors thrived under a form of monastic leadership which depended upon the ideals of the Christian Fathers for its authority. But an institution, unlike an individual, may persist a long time after its usefulness is accomplished. When the little communities no longer needed the lesson of contented living through restraint and craftsmanship, monasticism waned but did not wholly disappear. The priory became the community church, and the prior the curate. Near the town of Reinosa there is a small mountain village called Retortillo. At the time of the year I found the priory, the peasants were cutting their winter hay. Everybody, from small tots perched atop of the loaded ox-carts and preventing the wind's blowing the hay away, to leather hided, wizened grandfathers and grandmothers who gathered the grass together as it was cut by the younger generation, took part. I first saw the rotund figure of the curate, swathed in his long black soutane, swinging a scythe with the others. It was near the hour of lunch, and he invited me to share his meal in the shade of the loaded cart while we discussed the possibility of making drawings of his little church. We finally arranged that his niece, who rode to Reinosa every morning with the milk, would stop at my hotel and carry my instruments up the mountain to Retortillo. He wanted me to ride on the little donkey too, and seemed surprised when I told him I preferred to let his niece ride!

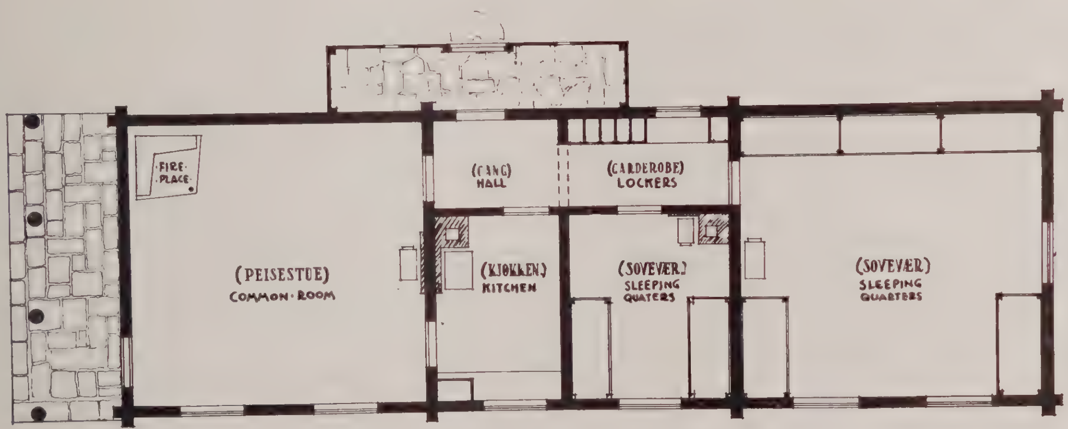
These brief accounts of the four priories,—Pontloup (Moret), Serabonne, Konradsburg and Retortillo,—are attempts to explain, through the measured drawings and archæological facts, the signifiance of the priory and its historical and sociological implications. Although the ascetic's most eloquent passages were the living moments of his life, archæology may make his ideals accessible to contemporary man. The aspirations of the Greek artist and the Hebrew prophet may be found again in them and reinterpreted by the discerning architect!

Editor's Note. This introduction to "Studies of Certain Priories of the Eleventh and Twelfth Centuries" serves to give a slight idea of the sympathetic and understanding treatment Mr. Lowenstein has given to the subject, a subject seldom studied or appreciated by the modern architect, and yet one which should be of inspiration and value to church builders of today. It was in the monasteries and priories of mediæval Europe that the fundamental principles of the early Christian faith, as well as the remnants of the intellectual culture of the Roman Empire were preserved, after the barbarians swept down over the land and destroyed the decadent civilization of southern Europe. It was here that the literary relics of the past, including early versions of the Bible, were safeguarded, translated and rewritten. It was here that the Catholic faith was enshrined until it burst forth with renewed strength and vigor, to find visual and architectural expression in the churches and cathedrals of England, France, Spain and Italy toward the end of the middle ages. What more natural, then, that the church builders of today should be powerfully influenced by the architecture of the monasteries and priories, in which the Church itself had been preserved, and which had been given new strength, new meaning and new architectural expression? It is for this reason that The Architectural Forum has availed itself of the opportunity to publish Mr. Lowenstein's valuable discussions on four of the oldest European priories, Pontloup (Moret), Serabonne, Konradsburg and Retortillo. The introduction to these discussions, published here, clearly indicates the several spiritual and religious influences which, in Mr. Lowenstein's opinion, gave to these old priory buildings such archæological and architectural value.

Milton D. Lowenstein, who was graduated from the architectural school of Columbia University, is now in Europe engaged in special research work for the Institute of International Education. A portion of the results of this work will be published next year in The Forum, particularly Mr. Lowenstein's studies of the "housing problem," as solved in Eurcpe.

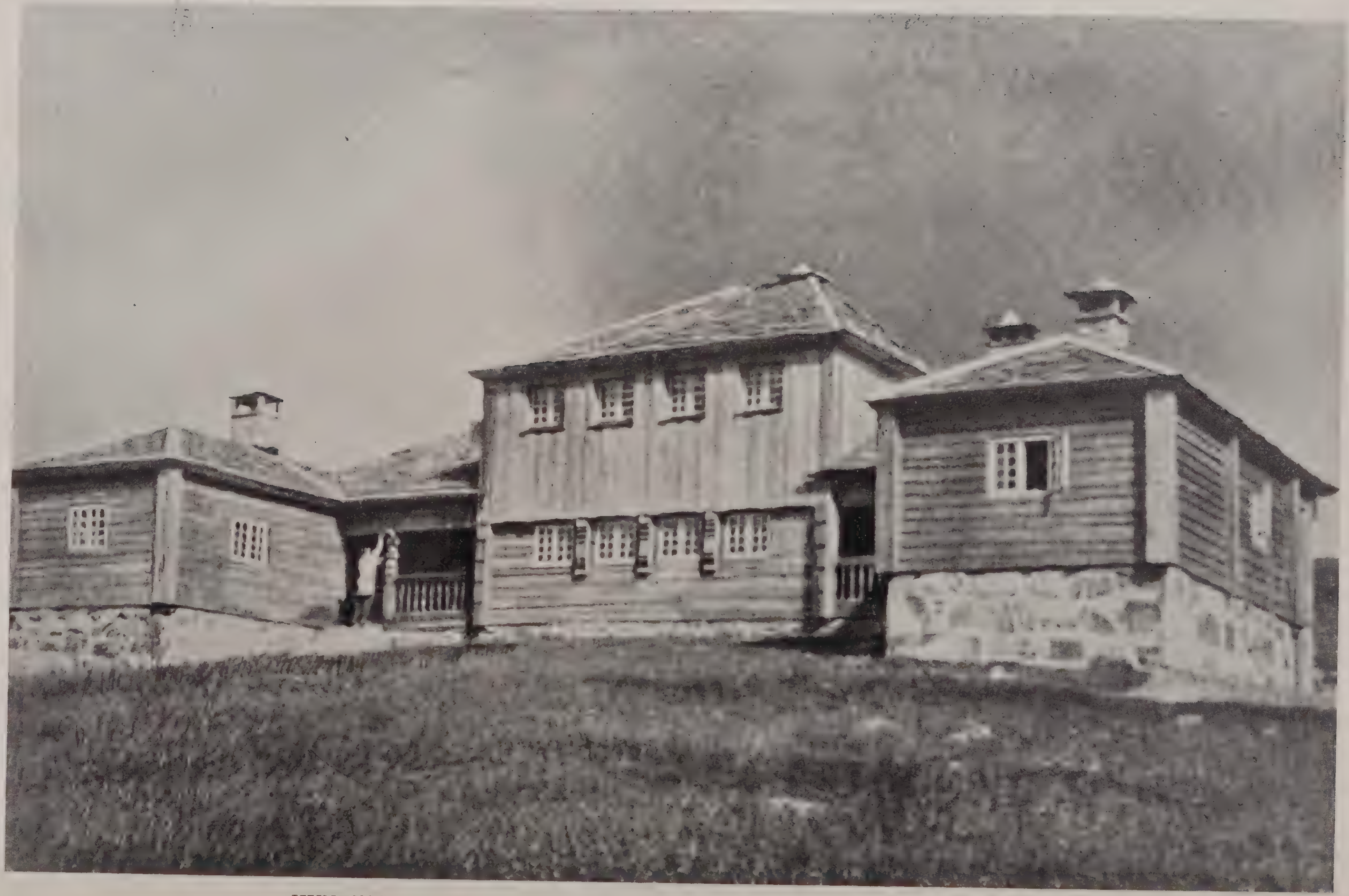


Photos. Sigurd Fischer

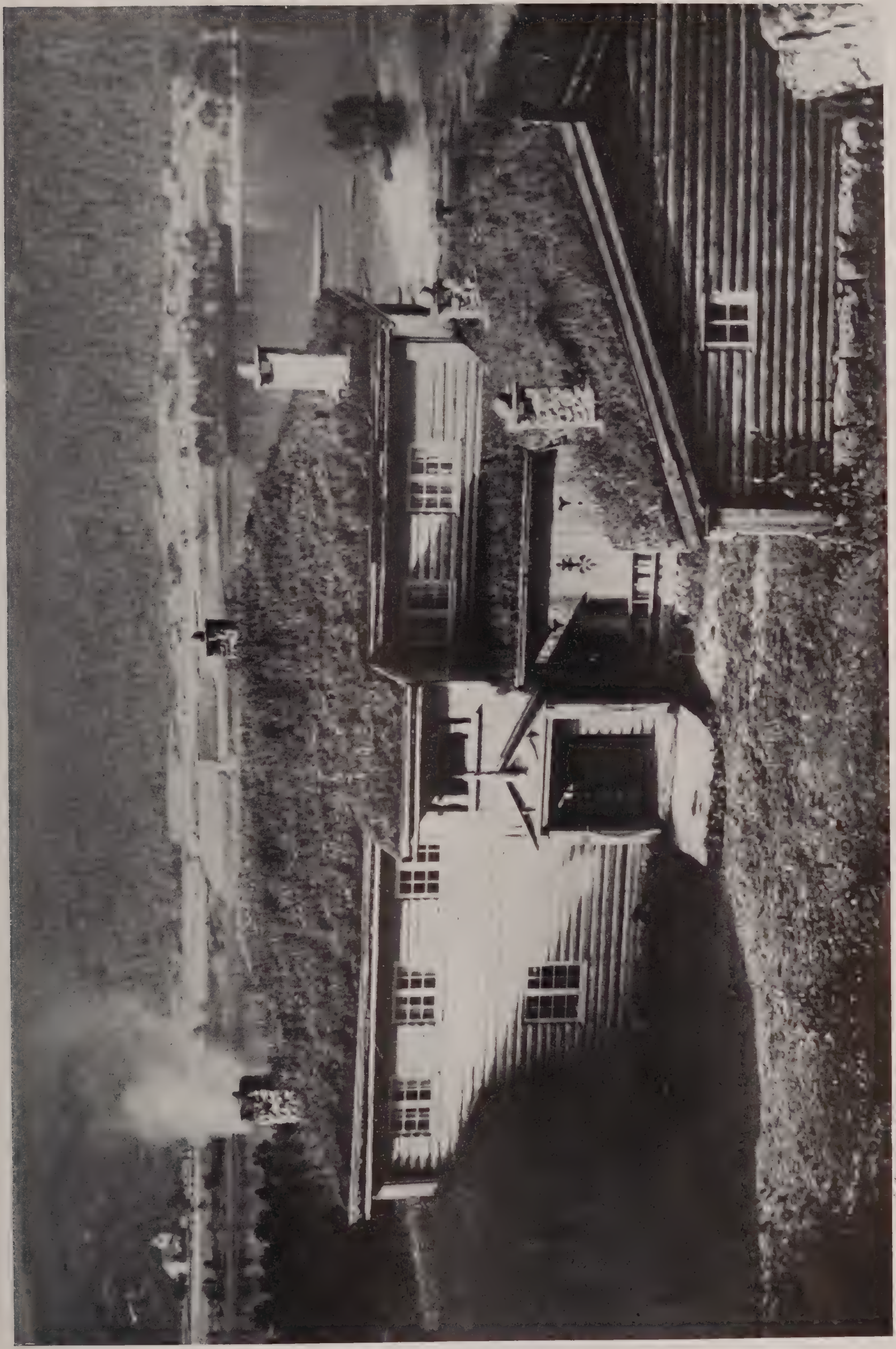


FIRST FLOOR PLAN

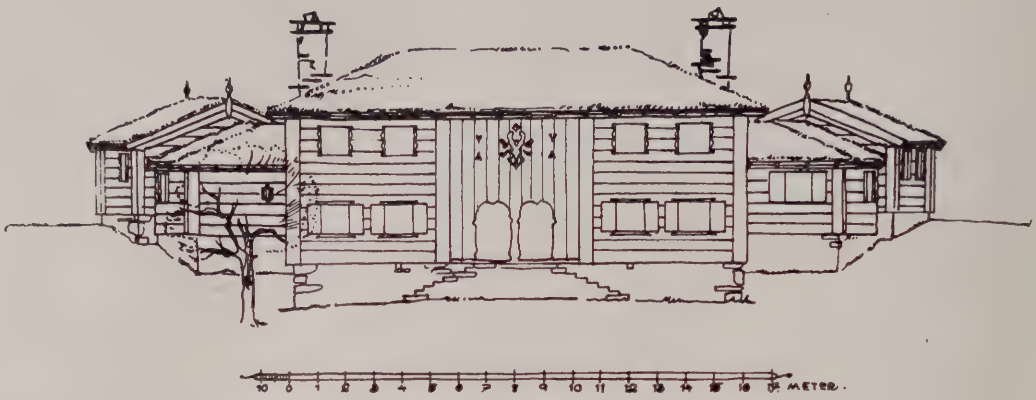
"SKI" CABIN FOR "SKI" CLUB, NORDMARKEN, NORWAY
HENRIK NISSEN, ARCHITECT



HUNTING LODGE FOR B. STANG, ESQ., SLETKOLLEN, NUMEDAL, NORWAY
MAGNUS POULSSON, ARCHITECT



MOUNTAIN HOUSE FOR EMIL STRAY, ESQ., SAETERDAL, NORWAY
MAGNUS POULSSON, ARCHITECT



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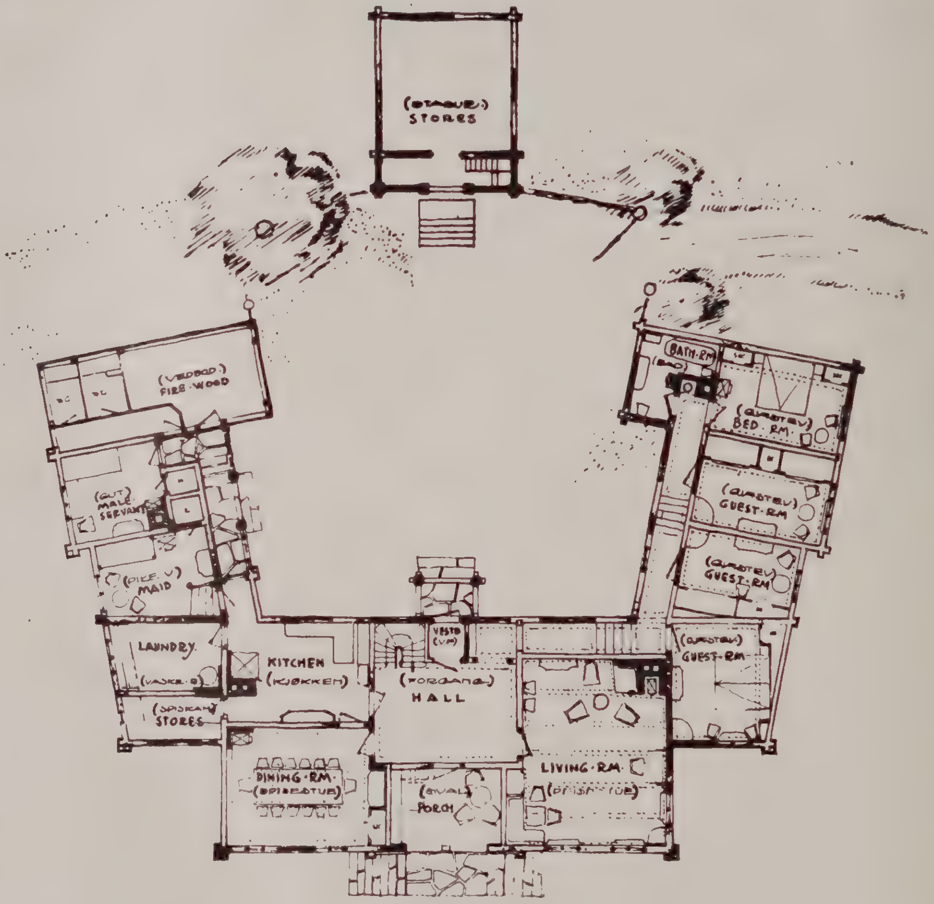

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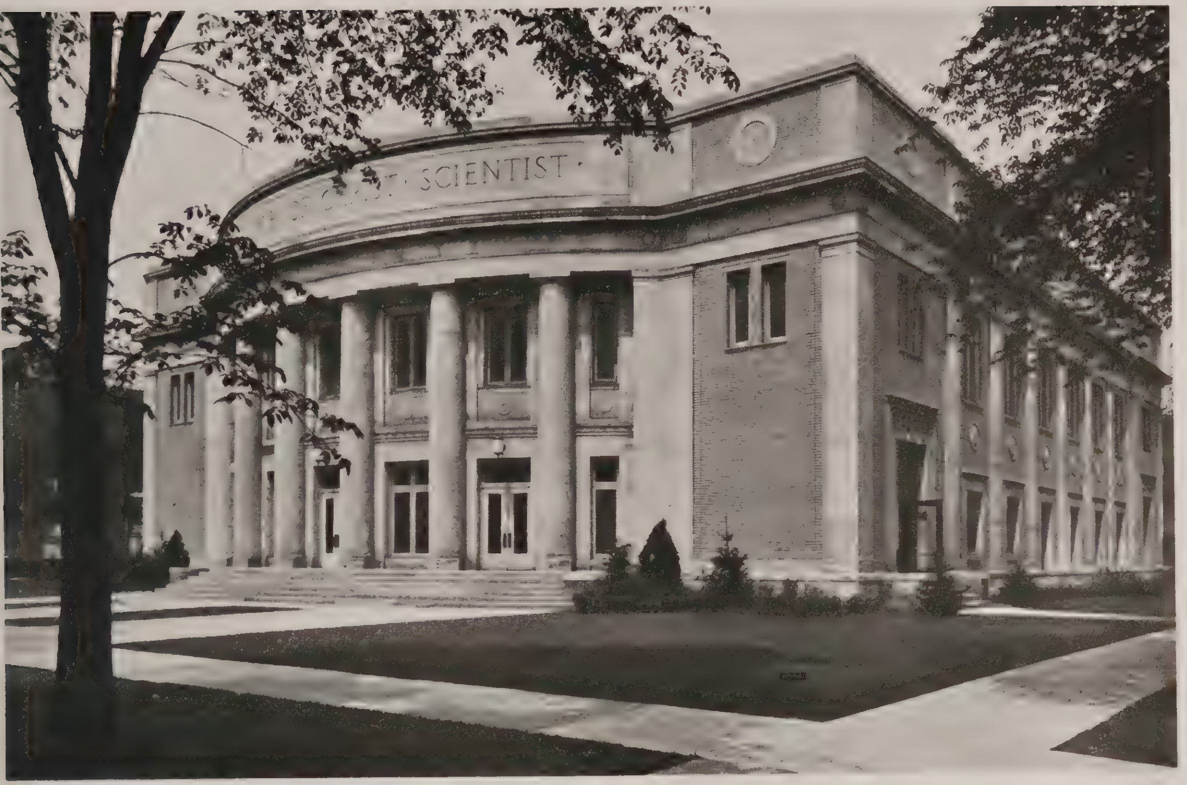
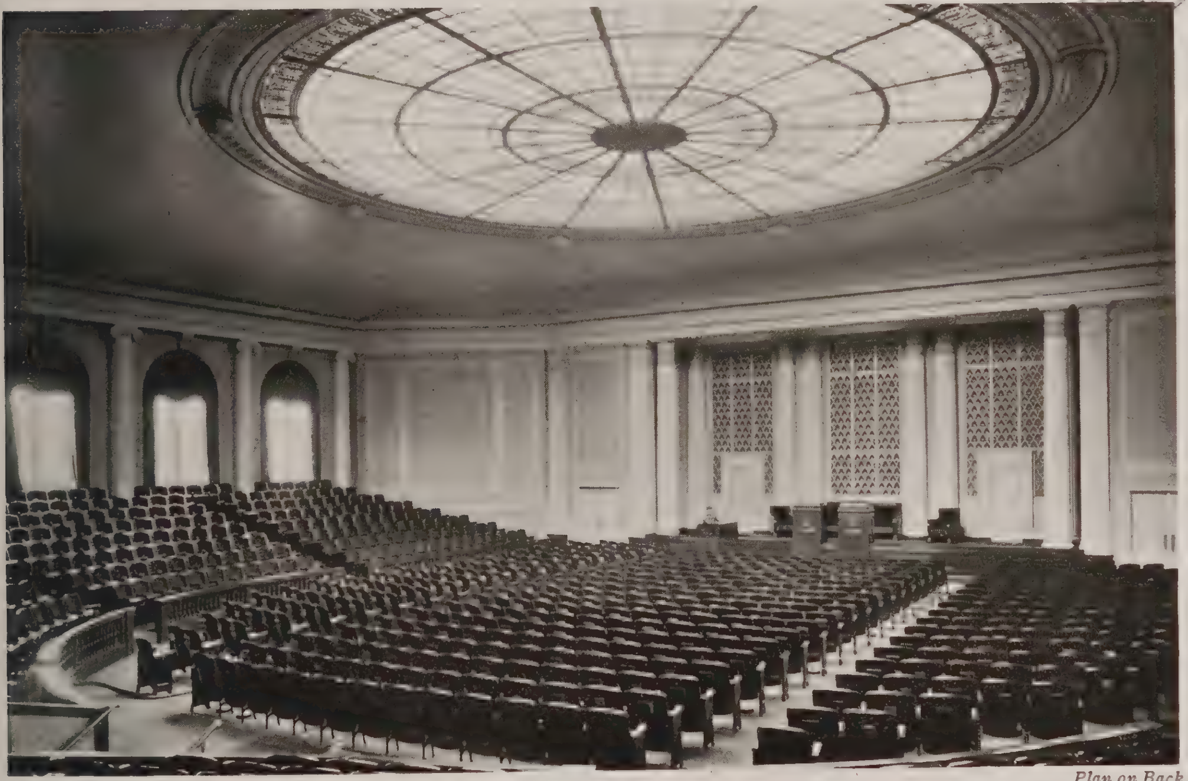
MOUNTAIN HOUSE FOR EMIL STRAY, ESQ., SAETERDAL, NORWAY
MAGNUS POULSSON, ARCHITECT



GENERAL VIEW



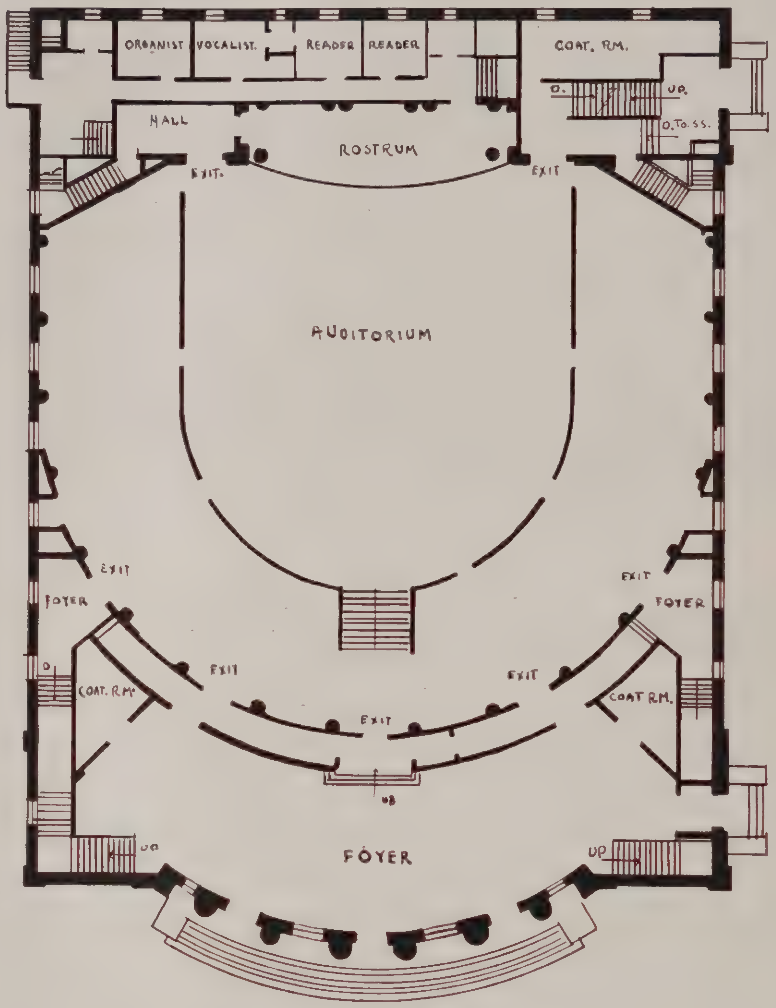
Photos. Thomas Ellison

Plan on Back

INTERIOR

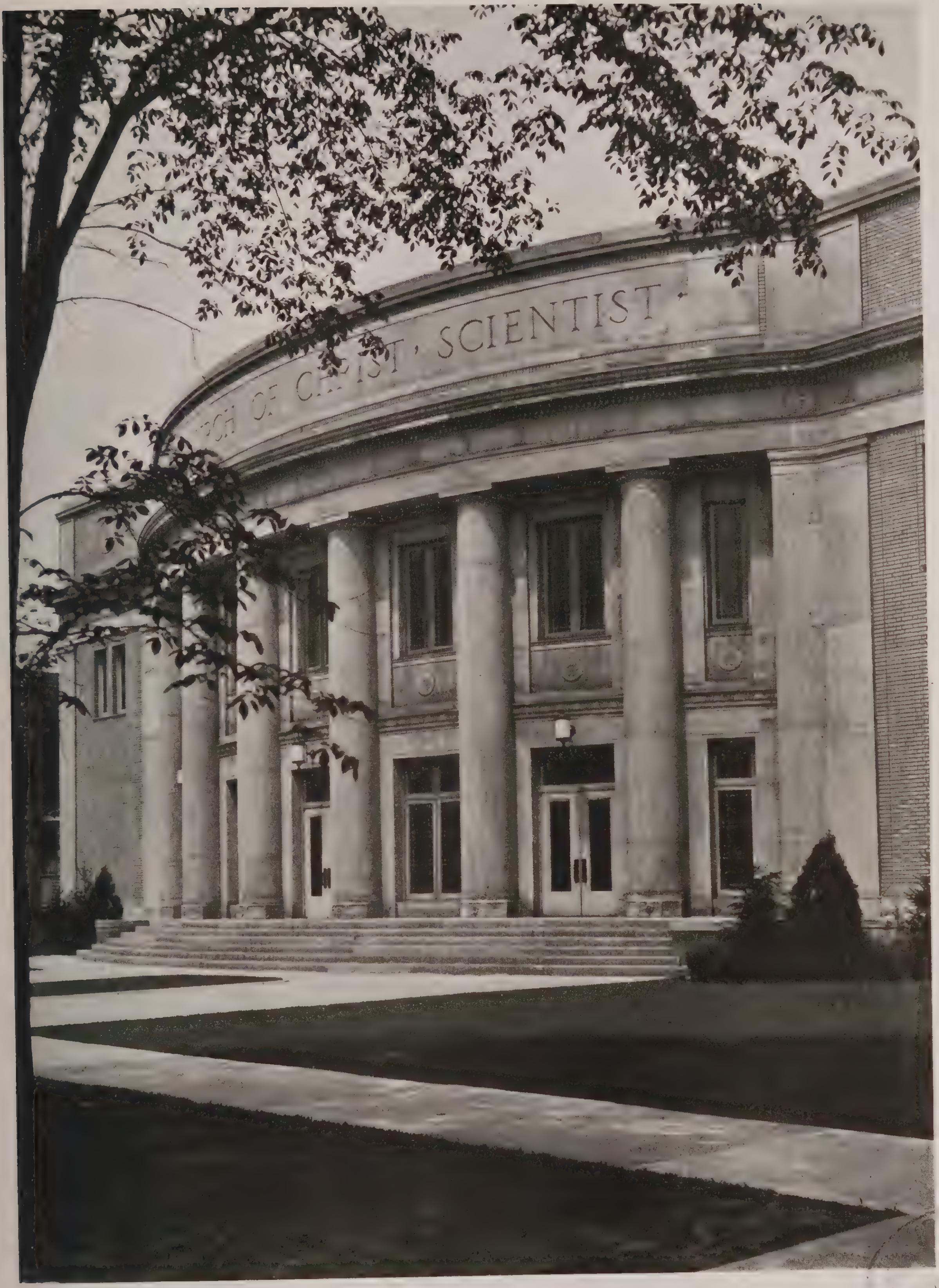
THIRD CHURCH OF CHRIST, SCIENTIST, DETROIT

GEORGE D. MASON & CO., ARCHITECTS

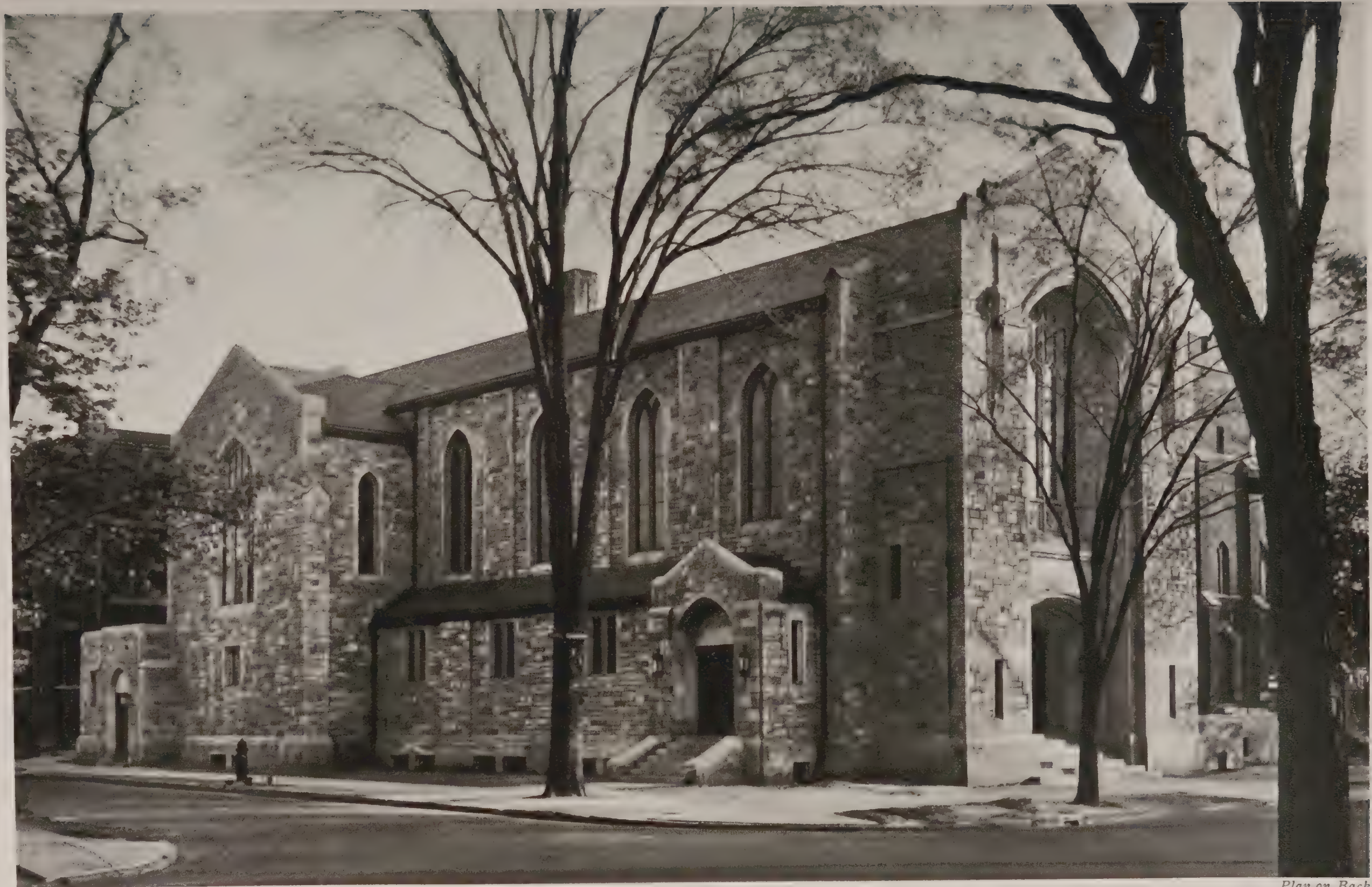


FIRST FLOOR

PLAN. THIRD CHURCH OF CHRIST, SCIENTIST, DETROIT
GEORGE D. MASON & CO., ARCHITECTS



MAIN FACADE
THIRD CHURCH OF CHRIST, SCIENTIST, DETROIT
GEORGE D. MASON & CO., ARCHITECTS



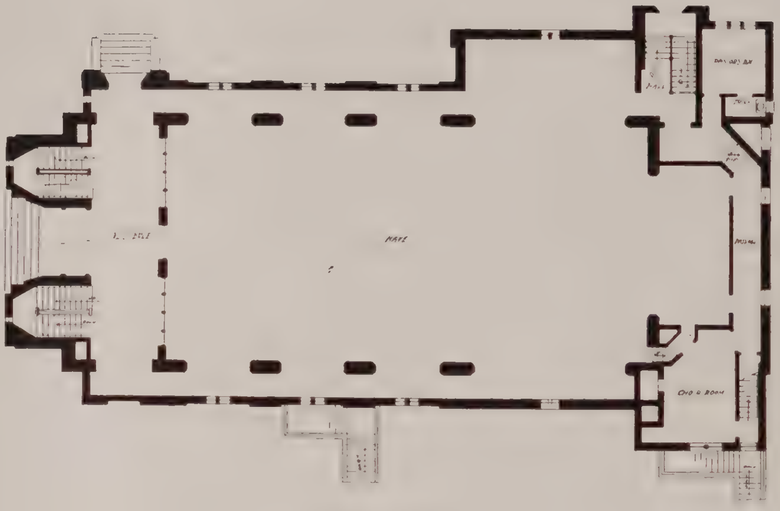
Photos. Thomas Ellison

Plan on Back

GENERAL VIEW

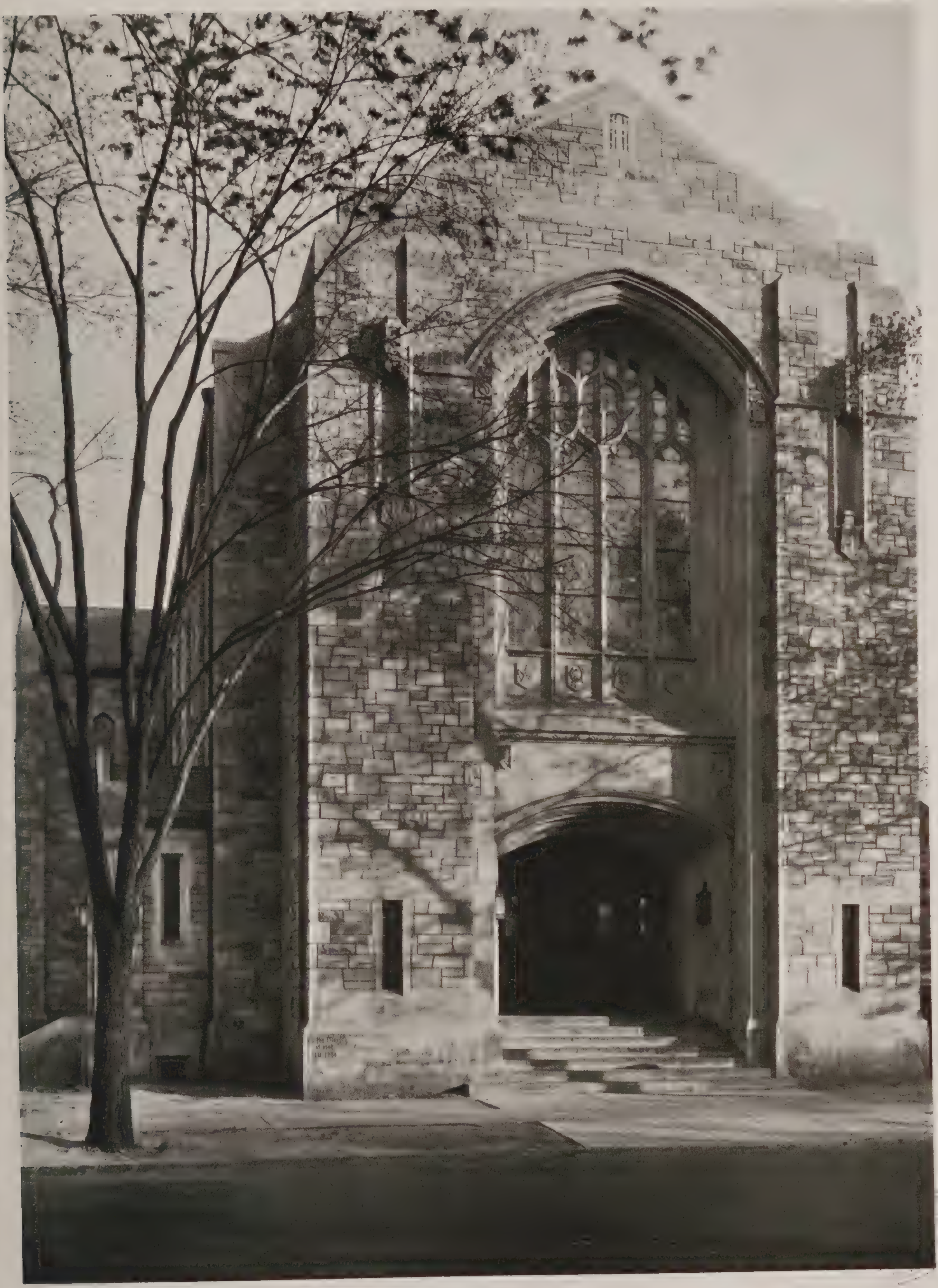
PRESBYTERIAN CHURCH OF THE REDEEMER, DETROIT

GEORGE D. MASON & CO., ARCHITECTS

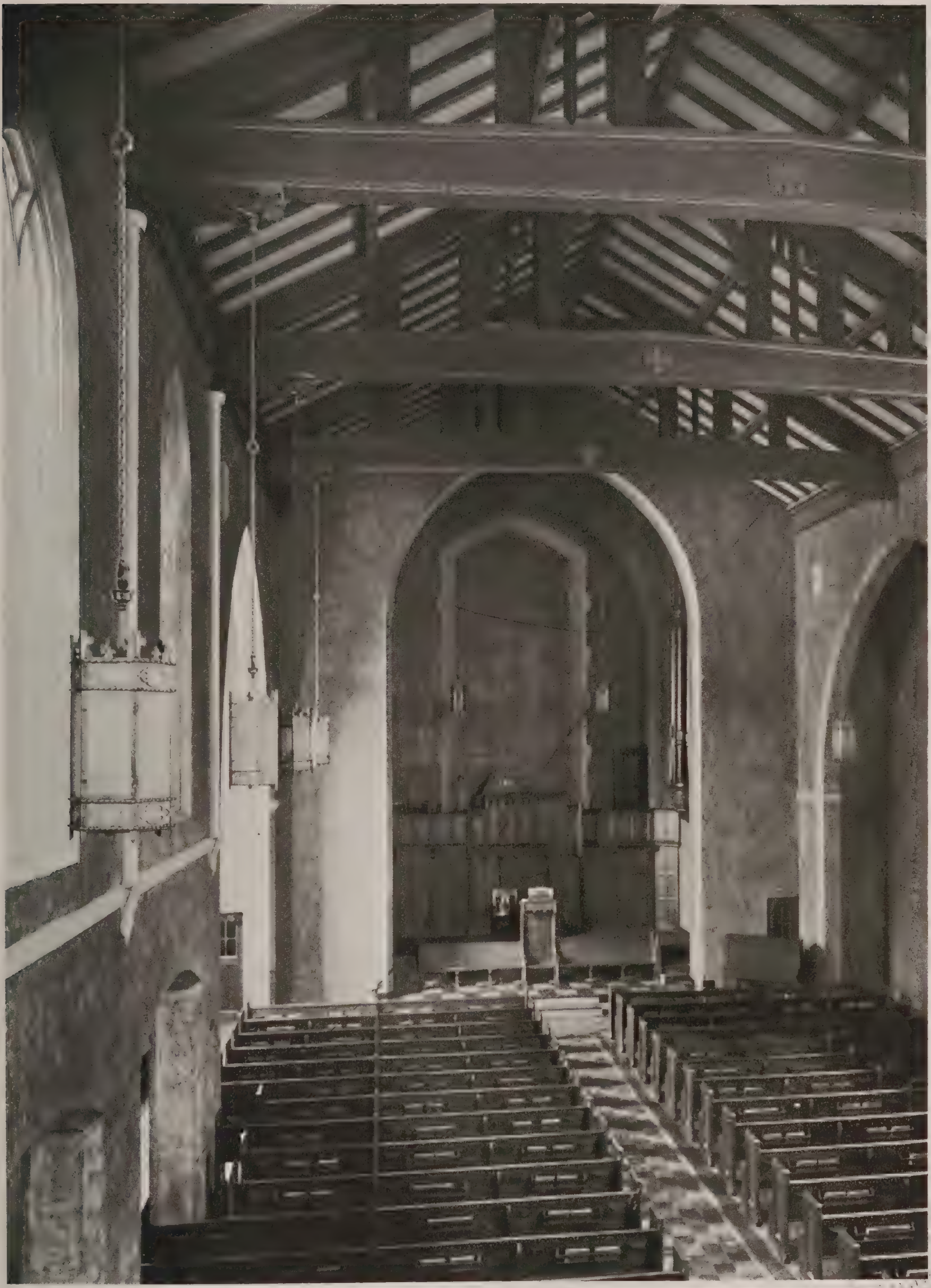


FIRST FLOOR

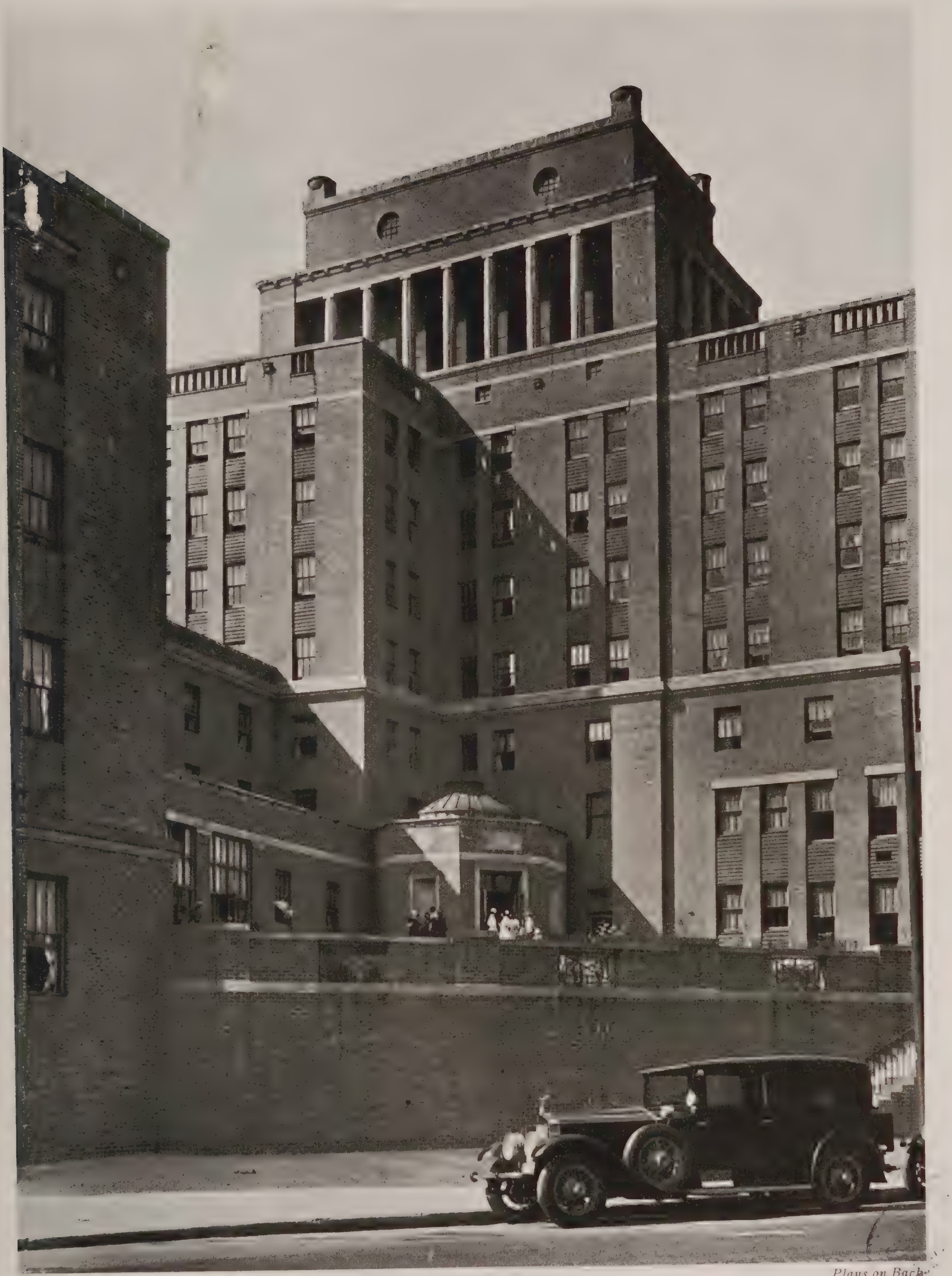
PLAN. PRESBYTERIAN CHURCH OF THE REDEEMER, DETROIT
GEORGE D. MASON & CO., ARCHITECTS



WEST FRONT
PRESBYTERIAN CHURCH OF THE REDEEMER, DETROIT
GEORGE D. MASON & CO., ARCHITECTS



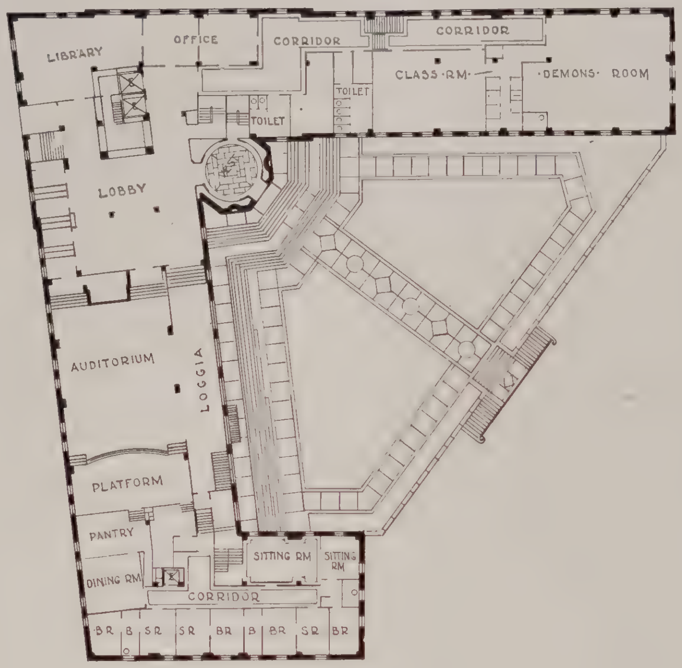
INTERIOR
PRESBYTERIAN CHURCH OF THE REDEEMER, DETROIT
GEORGE D. MASON & CO., ARCHITECTS



Photos. S. H. Gottscho

Plans on Back

LINCOLN SCHOOL FOR NURSES, NEW YORK
PENNINGTON & LEWIS, INC., ARCHITECTS



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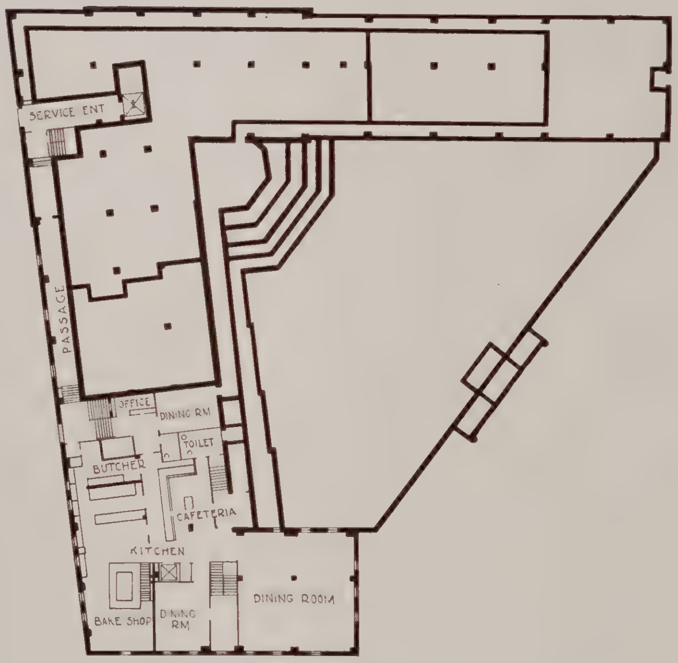
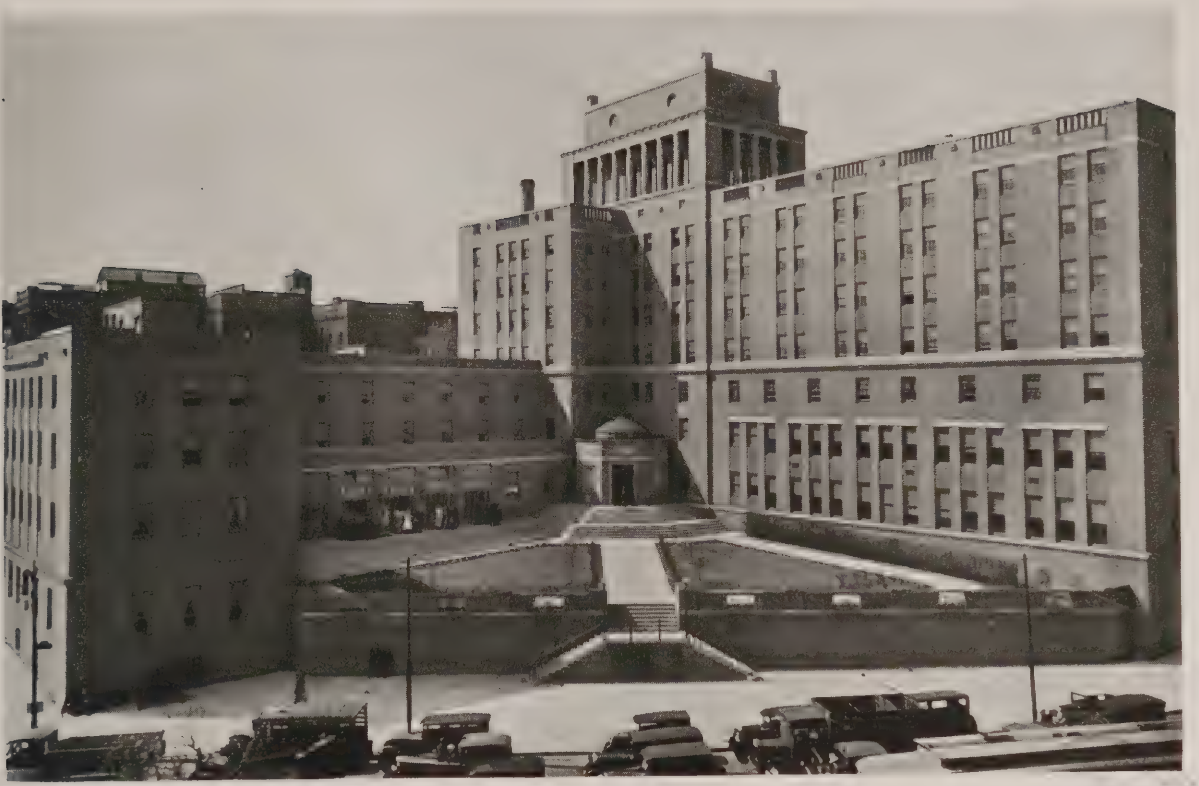
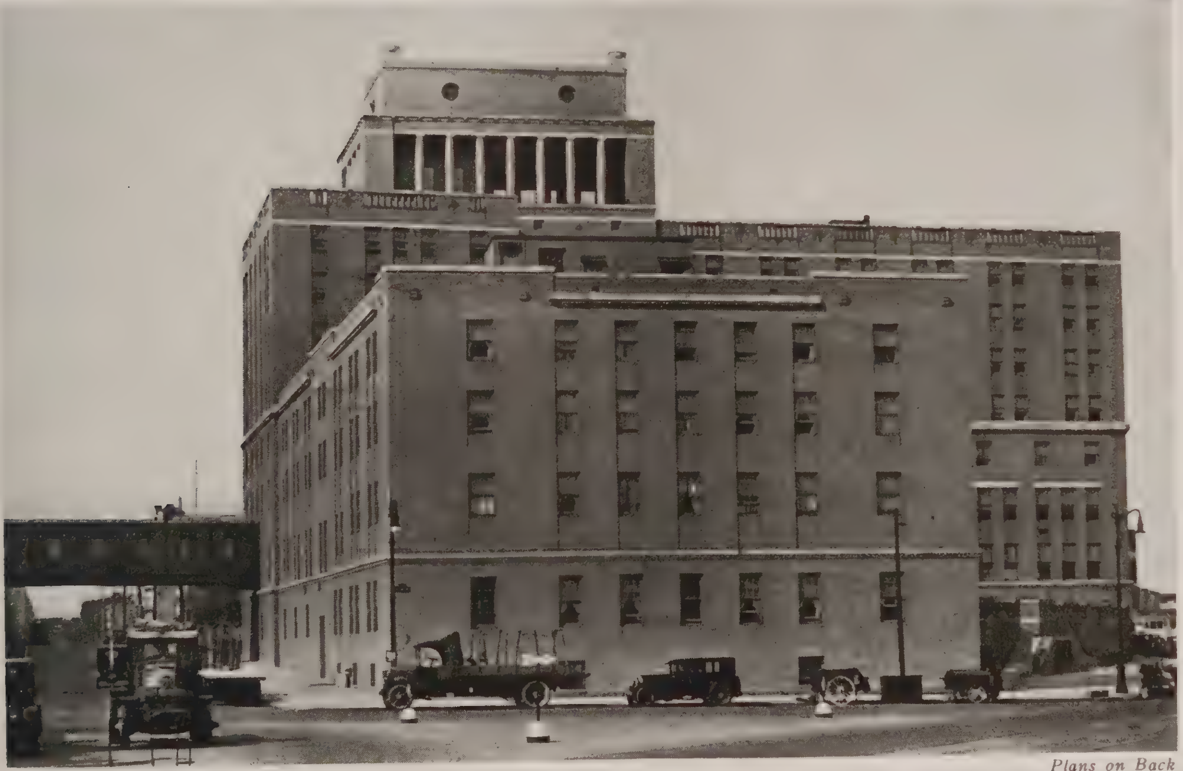


FIRST FLOOR

PLANS, LINCOLN SCHOOL FOR NURSES, NEW YORK
PENNINGTON & LEWIS, INC., ARCHITECTS



GENERAL VIEW

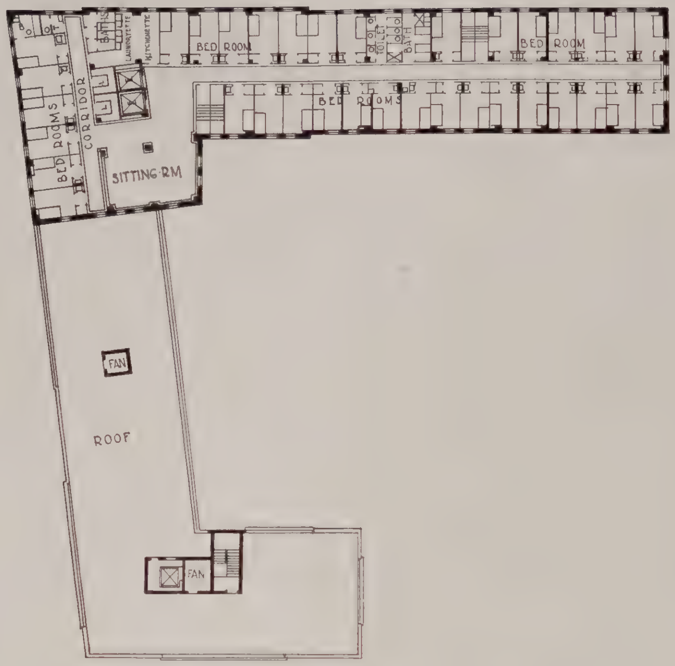


Plans on Back

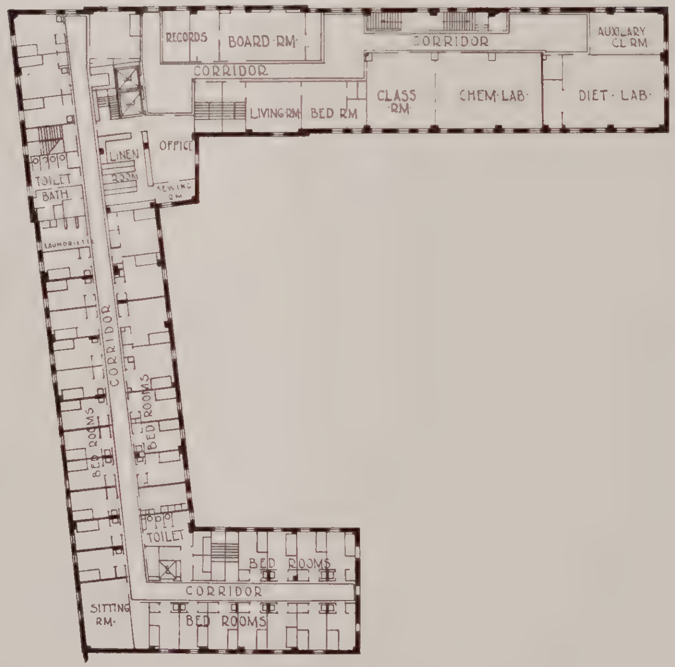
VIEW FROM 141st STREET

LINCOLN SCHOOL FOR NURSES, NEW YORK

PENNINGTON & LEWIS, INC., ARCHITECTS

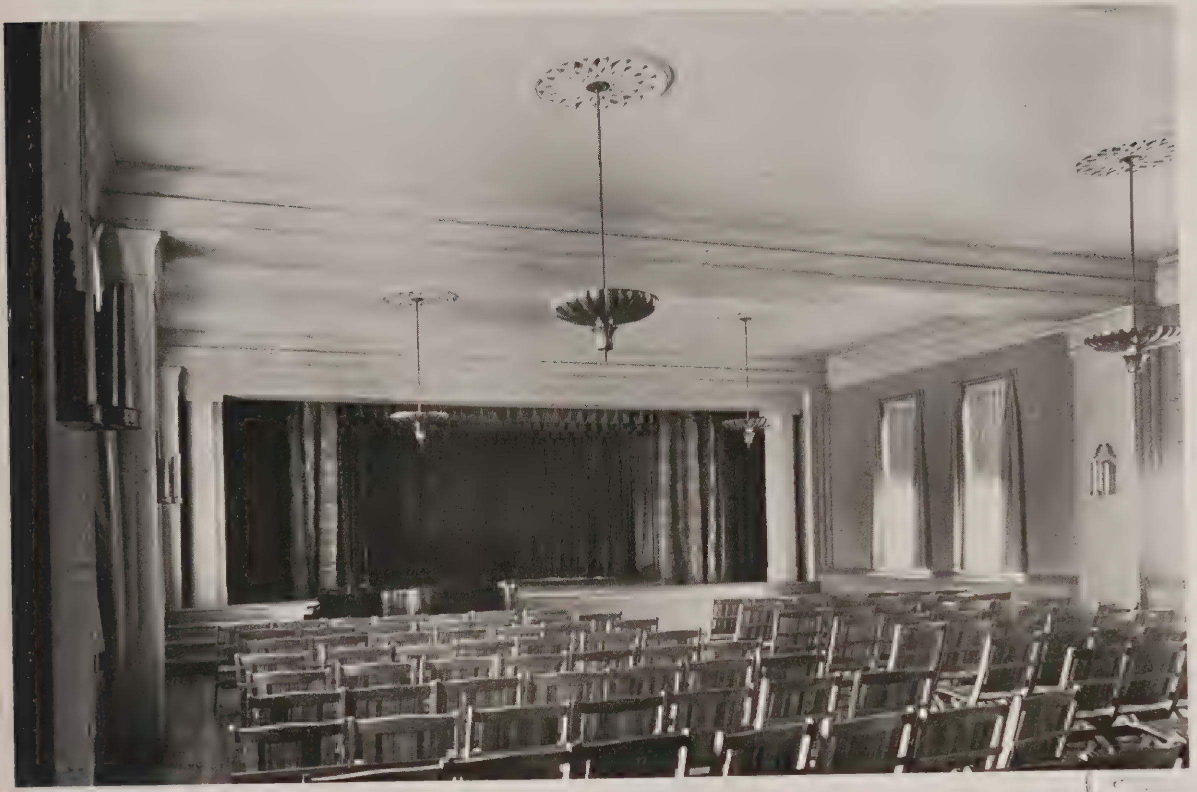


FIFTH, SIXTH & SEVENTH FLOORS

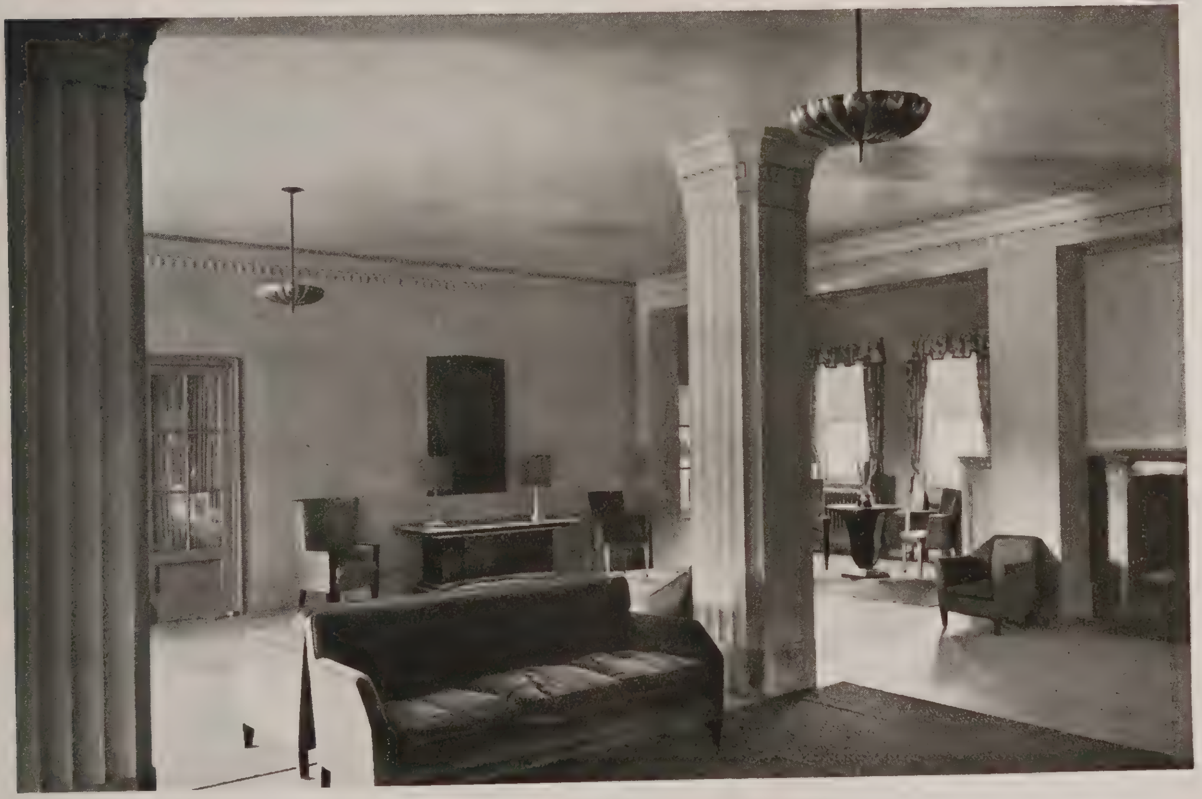


THIRD FLOOR

PLANS. LINCOLN SCHOOL FOR NURSES, NEW YORK
PENNINGTON & LEWIS, INC., ARCHITECTS



AUDITORIUM



LOBBY

LINCOLN SCHOOL FOR NURSES, NEW YORK

PENNINGTON & LEWIS, INC., ARCHITECTS

THREE GARDENS AT GROSSE POINTE, MICH.

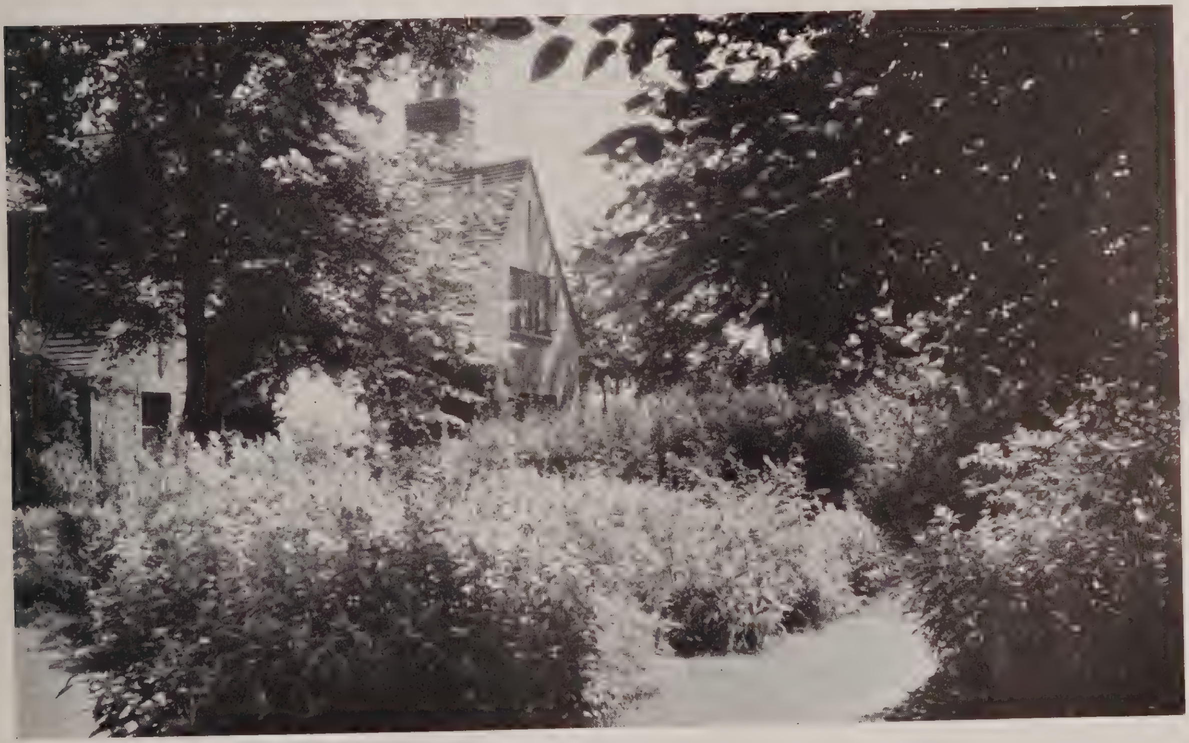
RUTH DEAN, LANDSCAPE ARCHITECT

BY
ANNE LEE

AWARDED The Architectural League's 1929 Medal of Honor in Landscape Architecture, Ruth Dean is the first woman to achieve this distinction. Although the award was made for three Grosse Pointe, Mich., gardens, it may be assumed that the background and professional prestige of the contestant were duly considered along with the specific gardens for designing which the medal was bestowed. The precedent established by this recognition of a woman landscape architect no doubt lends encouragement to the increasing number of women engaged in that profession. Sixteen years of independent practice, following her training at the University of Chicago and varied experience in both architecture and landscape work here and abroad, have given Miss Dean every type of landscape problem to solve. Her commissions have included developing tiny plots as well as small and large estates in various parts of the country, and the results have earned for her a name for successful work in the planning and planting of gardens. Due to her knowledge of architecture, this landscape architect has also acquired a habit of thinking in terms of architecture, of working with the two-fold purpose of creating a garden that is not only beautiful in itself but that affords a proper setting for the specific house to which it belongs.

The medal-winning Grosse Pointe gardens exemplify the diversity of Miss Dean's landscaping. Two of the three gardens,—those of Mrs. Howard Bonbright and Ledyard Mitchell,—are somewhat architectural in plan although informal in feeling, whereas the third,—that of Hiram Walker,—is distinctly naturalistic. The former two, each consisting of an acre or a bit less, illustrate the possibilities of this popular sized plot. So designed that they afford considerable privacy and adequately meet the needs of their owners, these gardens are examples of securing the maximum utilization of comparatively small areas. Restfulness has been achieved by means of a well balanced relationship between open stretches of lawn and luxuriant planting in the one case, and in the other between large, old trees and beds of perennials. Grass paths, pools and effective brick walls are features of both gardens.

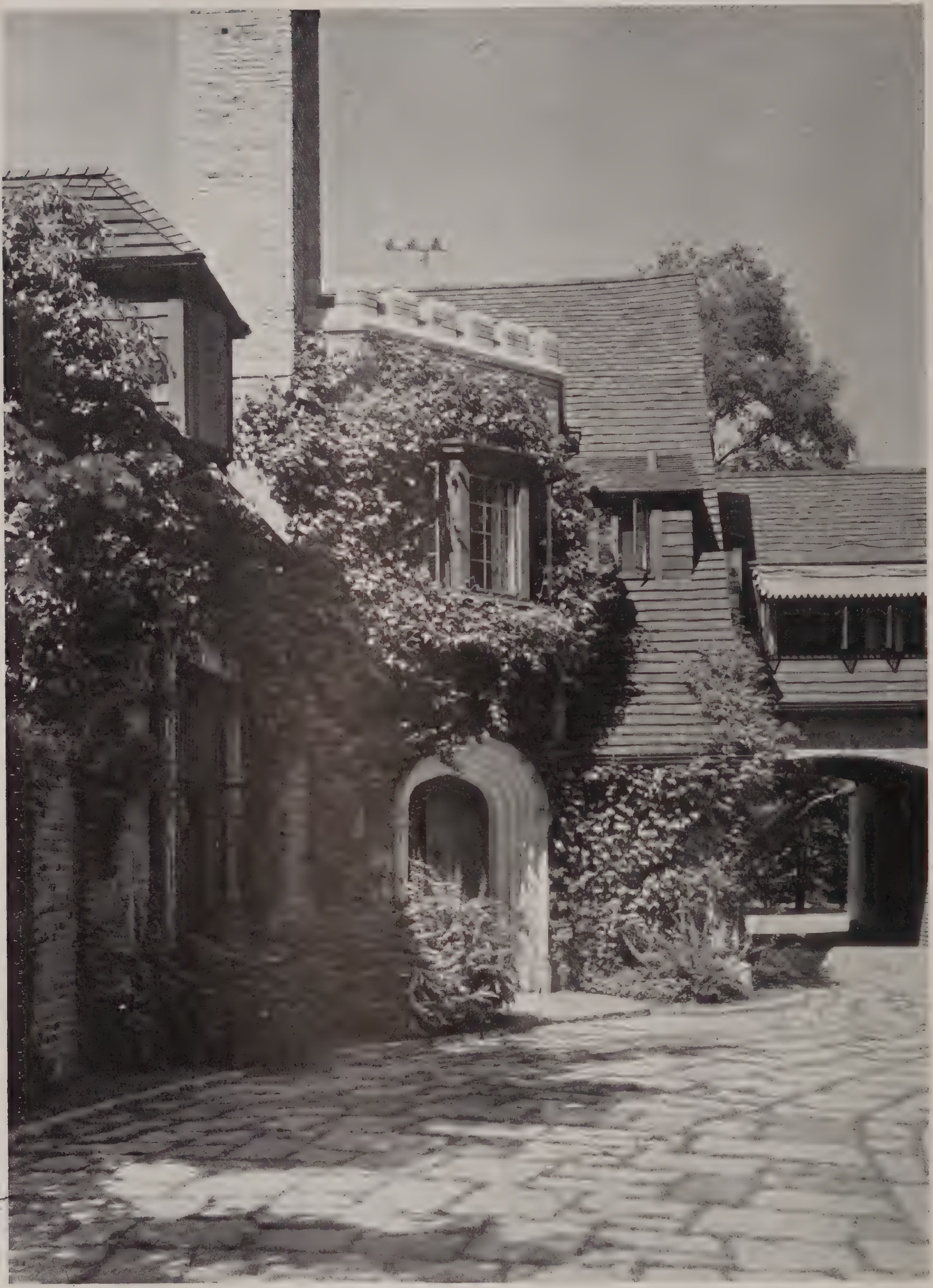
Somewhat unusual in plan is the Bonbright garden. The fan-shaped arrangement met the client's desire to have the garden afford an effect



Photos. Tebbs & Knell, Inc.

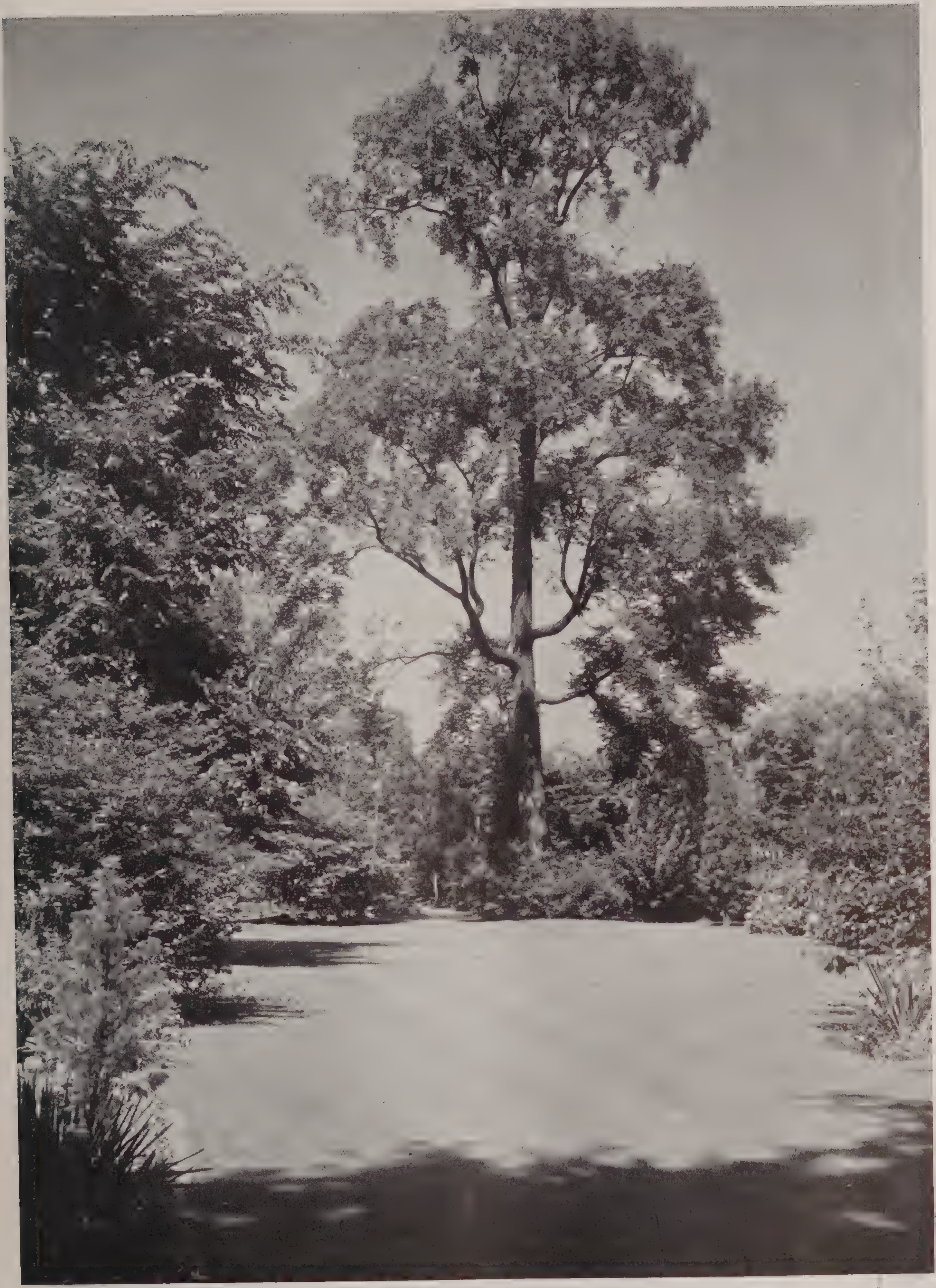
Careful Planting of Perennials, With Grass Paths, Produces Interesting Effects in the Hiram Walker Garden

Ruth Dean, Landscape Architect



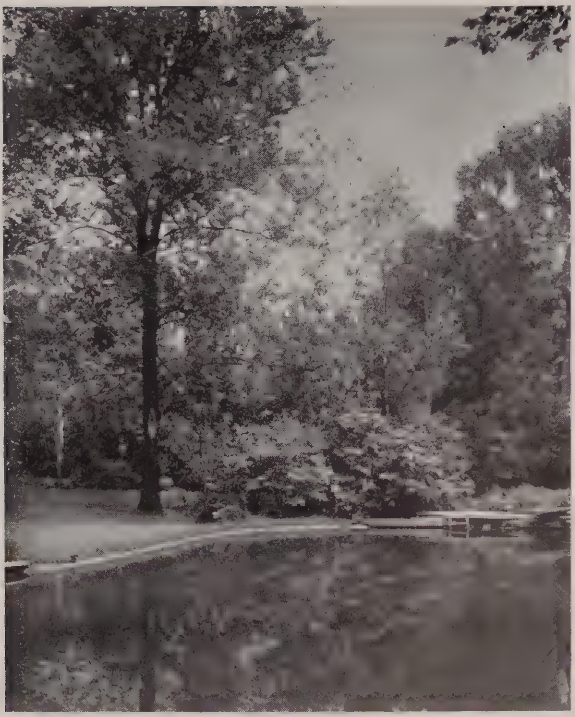
VIEW OF THE HOUSE OF HIRAM WALKER, ESQ., SHOWING TERRACE AND PLANTING IN COURTYARD

RUTH DEAN, LANDSCAPE ARCHITECT

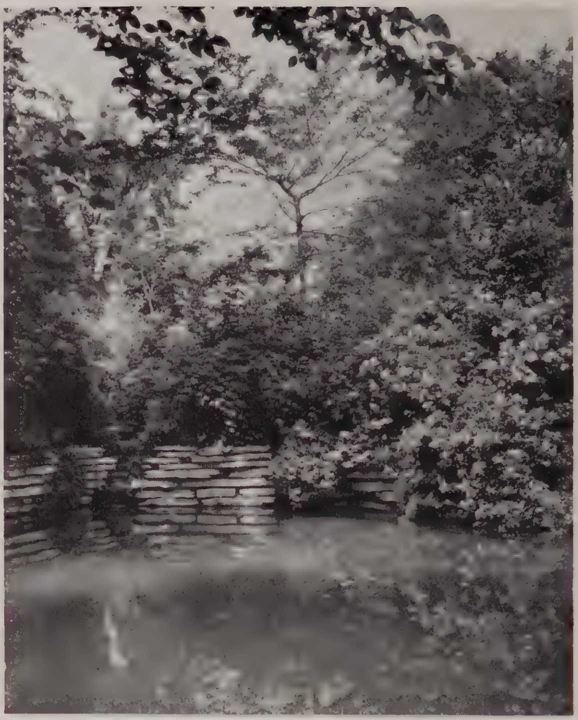


VIEW FROM THE HOUSE OF HIRAM WALKER, ESQ., SHOWING THE PRIVACY OF THE GARDEN

RUTH DEAN, LANDSCAPE ARCHITECT



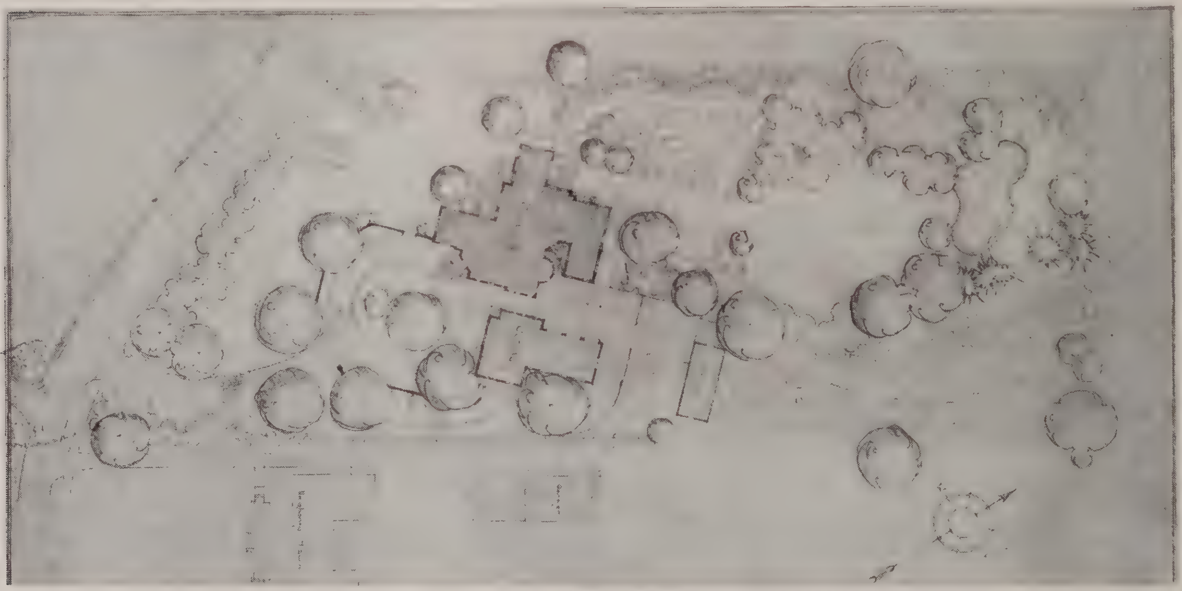
Although the Illustration Shows the Concrete Rim of the Pool, Which Was Not Entirely Filled, It Was So Built That Grass Could Be Grown to Meet the Water Line Without Showing Concrete



Limestone Slabs Give the Pool a Picturesque Effect with Water Spilling Over Stones from an Upper Level to Give the Effect of a Natural Spring-fed Pond

Garden of Hiram Walker, Esq.
Ruth Dean, Landscape Architect

of spaciousness and at the same time seem intimately related to the terrace. This was accomplished by keeping the main axis open and by using side paths that radiate from the terrace. To lend an effect of distance, hawthorn trees were placed in front of the pool, one on each side of a path wide enough to permit a view and give depth. Due to the square-shaped plot, the landscape architect found it necessary to secure an effect of depth entirely by means of planting. There was



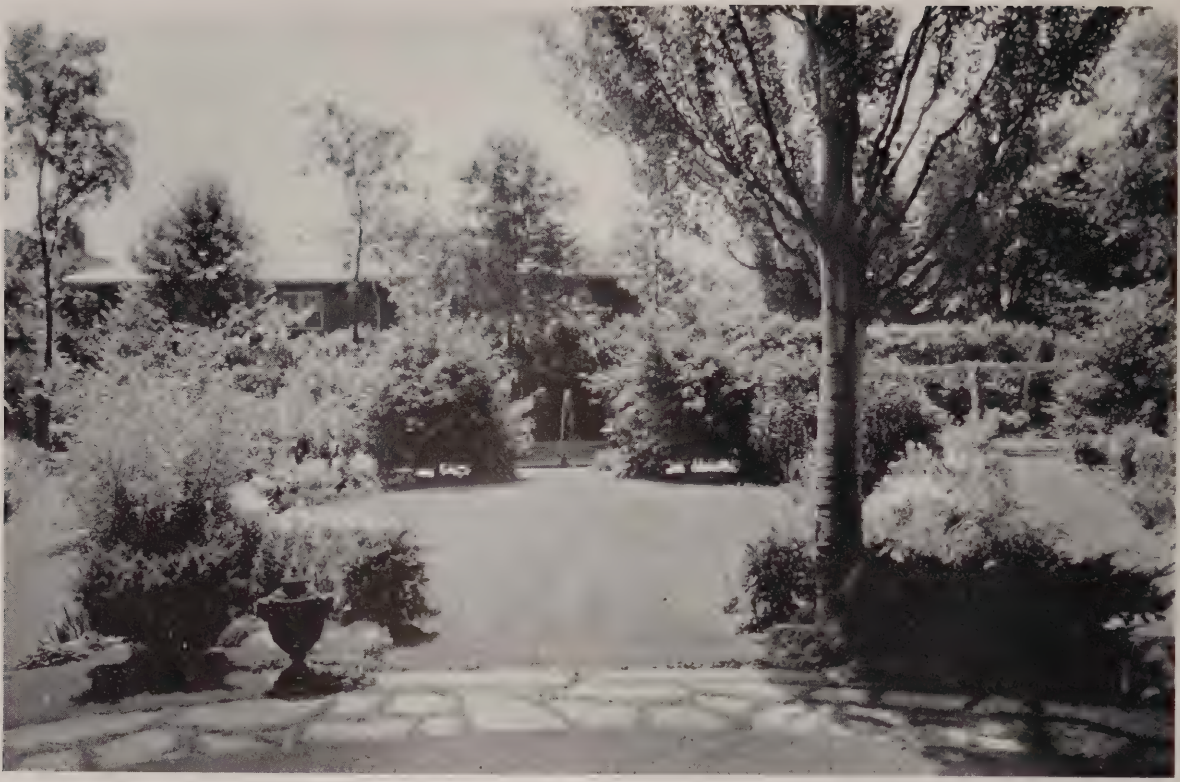
Sketch Plan. Garden of Hiram Walker, Esq.
Ruth Dean, Landscape Architect

Flower Beds in the Garden of Hiram Walker, Esq.
Ruth Dean, Landscape Architect

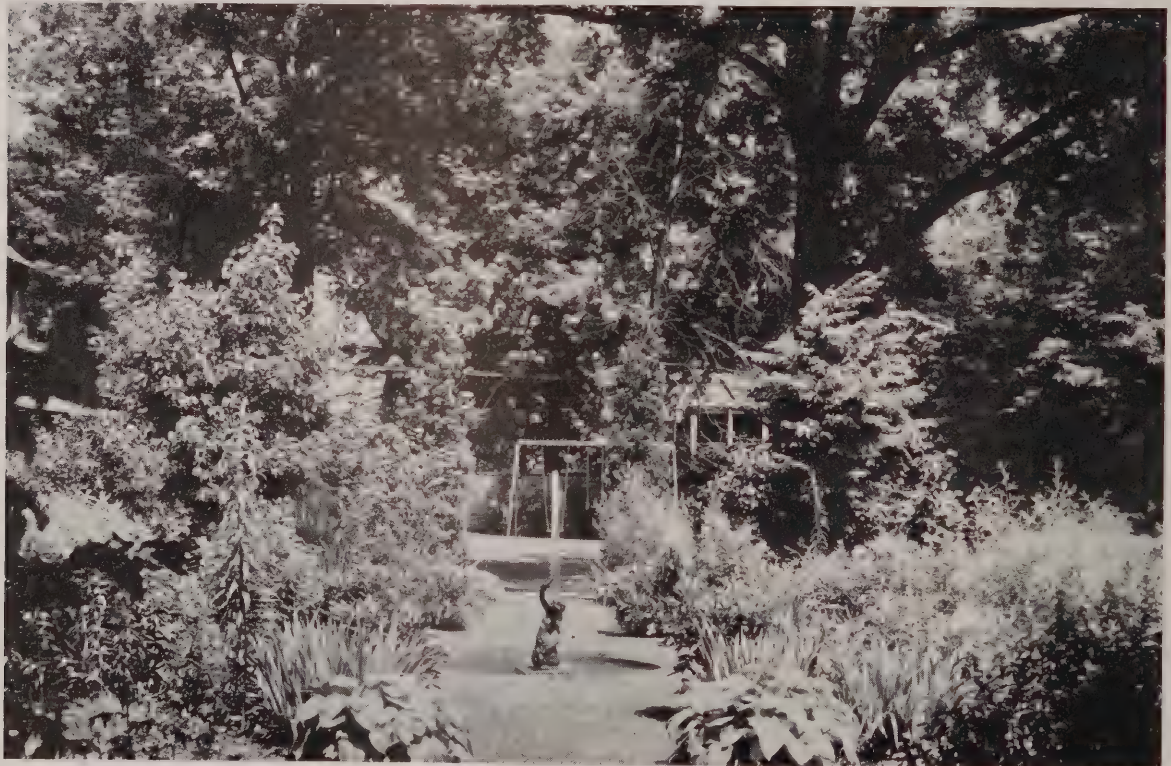
little or nothing available in the way of trees to begin with. To block out a rather high brick house on the adjoining property, it was necessary to depend upon heavy planting to give seclusion.

In the Mitchell garden, the red brick wall, built with piers and capped with flagstones, serves as a background for vines, primroses, ferns, Canada lilies, plantain lilies, Solomon seal, snakeroot and violets, these plants having been used because of the amount of shade thrown by the splendid, old large maples and because of the fact that they take so much nourishment from the soil.

The Walker garden,—which shows the most ingenious planning and is perhaps the most interesting of the three,—comprises about four acres. With a frontage of only 250 feet and a depth of 500 feet on one side and 800 feet on the other, the plot presented something of a problem. The existence of number of large elms and native hawthorns suggested adopting the naturalistic style of treatment. So successfully was it carried out that the visitor is inclined to give to nature the credit which really belongs to the landscape architect. Referring to this garden, Miss Dean spoke of it as an ideal operation on which to work. The beauty of the piece of land, a sympathetic client and a most coöperative architect combined to make it so. From the time the first sketches for the house were drawn, Miss Dean worked with the architect. Together they decided upon the location of the house. Making a detailed survey of the land, they experimented with a small, scaled model of the house to determine the most desirable building site,—a location which would assure privacy from neighboring houses and the most advantageous outlook from the principal rooms. Besides accomplishing those objectives, they so placed the house among the trees that they appear to enfold it. The plan included here shows the effective arrangement of the vegetable, herb and flower gardens, the latter with irregularly shaped beds and grass paths. There is a wide grass lane through the vegetable garden, which was carefully planned with cut flower borders to edge the paths and with a grape arbor at the far end to help frame it. A large, irregularly shaped swimming pool set among the trees at the rear of the plot is one detail of the Walker garden. In its successful naturalistic effect, there is no hint of the conscientious effort that was made to have it appear that the pool was the work of nature. Excavation for the concrete tank provided earth for a rise in the land at one end, the level of which is 4 feet higher than the pool level. By lining that end of the pool with slabs of mellow-toned limestone, only the weathered edges of which are exposed, and by piping the water to the top of the rise so that it spills over the stones into the pool, the effect is that of a natural spring's being the source of supply. This naturalistic effect was further heightened by building the concrete tank so that earth could be

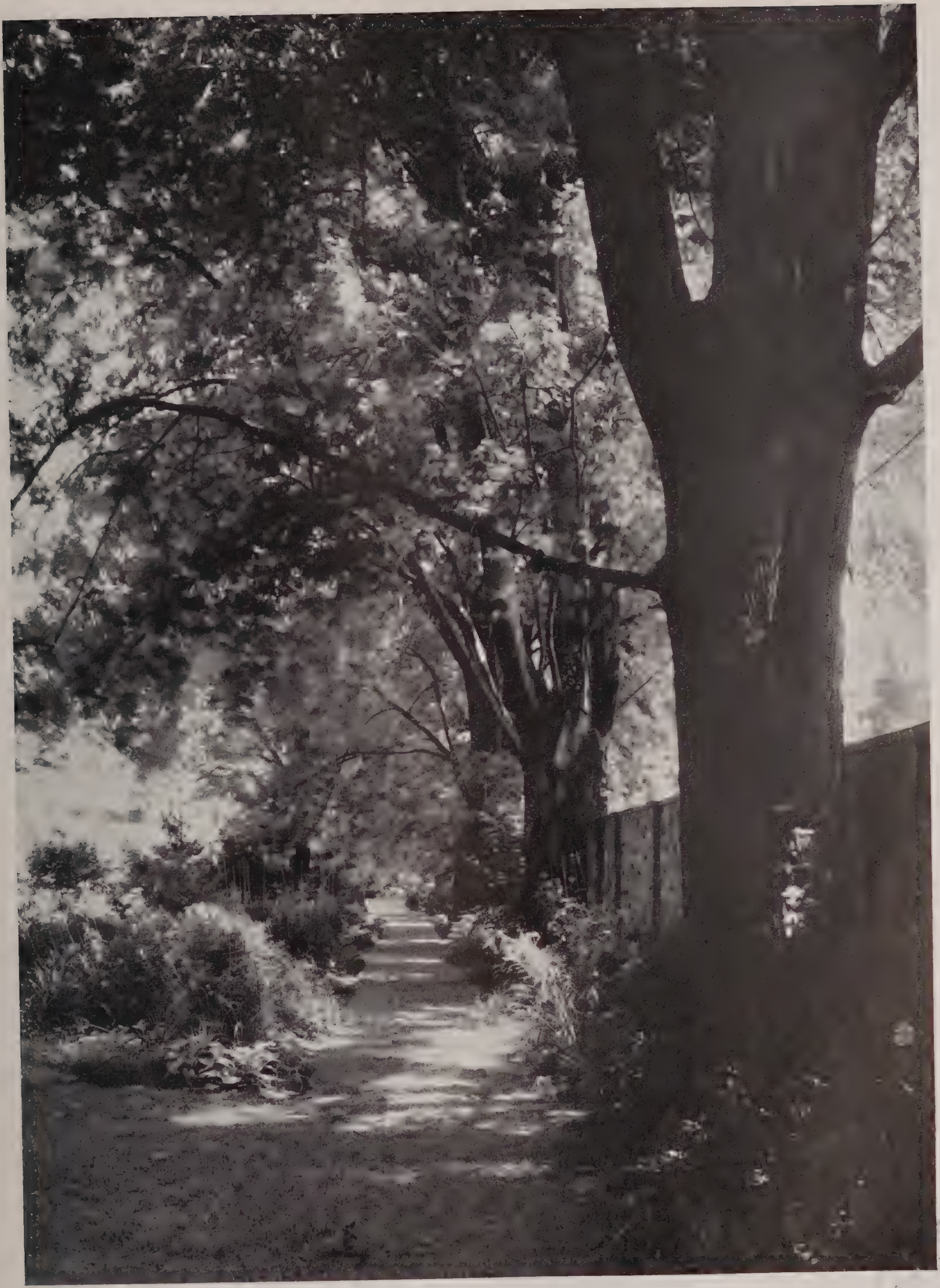


VIEW OF GARDEN FROM THE TERRACE, SHOWING LARGE OPEN SPACE IN CENTER WITH PATHS AT THE SIDES



A PLAYGROUND IS LOCATED AT ONE END OF THE PLOT; GARDEN OF MRS. HOWARD BONBRIGHT

RUTH DEAN, LANDSCAPE ARCHITECT



A LONG GRASS PATH BETWEEN BEDS OF PERENNIALS LEADS TO THE POOL IN THE GARDEN OF LEDYARD MITCHELL, ESQ.

RUTH DEAN, LANDSCAPE ARCHITECT

Two Views of the Garden of Mrs. Howard Bonbright

Ruth Dean, Landscape Architect

placed over the receding rim in order that grass might be grown to the edge of the water line. Due to the fact that the tank had not been entirely filled when the pool was photographed, the rim is visible in the two illustrations shown on page 508.

Wild prairie roses and wild grape, banked behind the pool so that their branches fall naturally over the stones, add to the effectiveness of the setting. The springboard is placed between beds of mint. Locust logs form the steps leading to the rise, where a rustic seat placed amid luxuriant foliage affords a secluded spot. The planting there includes shadbush, black alder, arrow-wood, hawthorns, ironwood, and some bittersweet. Elders, white birches, beeches, elms and oaks are to be found among the trees behind the pool. To approach the swimming pool from the house, one may take either of the two paths leading from the paved area outside the dining terrace. The narrow grass path separates beds of perennials, luxuriant with bloom throughout the seasons, from tulips to chrysanthemums. Skirting a clump of trees, including large existing sycamores, lindens and a hawthorn, this path rambles through a delightfully wild retreat, where plant life native to that region is allowed to grow in profusion amid numerous trees that make the spot a woodland nook. The planting there includes snakeroot, baneberry, wild asters, beebalm, Solomon seal, wild columbine, lady slippers and several varieties of native ferns. There are witch-hazel, high bush cranberry and ninebark shrubs, and the trees include the white pine, bird cherry, elder and Judas. The other path is a broad grass lane that runs past the rose garden to the large, beautifully kept lawn, across it and through the trees to the pool. Both paths were planned to lend pleasant vistas from the dining terrace. Several large elms are so situated on the property that shadow effects on the lawn are lacy and interesting, the landscape architect having made an effort to avoid too much solid black in the shadows. Proper placing of trees will produce shadows to break a plain stretch of lawn, and that was kept in mind.

Among its other charms, the Walker garden has the effect of spaciousness and the privacy achieved by the planning as foremost factors. Because of the shape of the property, this accomplishment is especially noteworthy. Work on this estate was begun in 1925, some of the planting having been done before the house was commenced. Since its completion the next year, Miss Dean has been called in to make an inspection and submit a report on the condition of the garden each spring and fall, her recommendations being carried out by the gardener. This may be another reason why the landscape architect refers to the Walker garden as "an ideal commission," —another reason, perhaps, why it helped win the Medal of Honor awarded to Miss Dean by The Architectural League at the Architectural and Allied Arts Exposition held in New York in April.

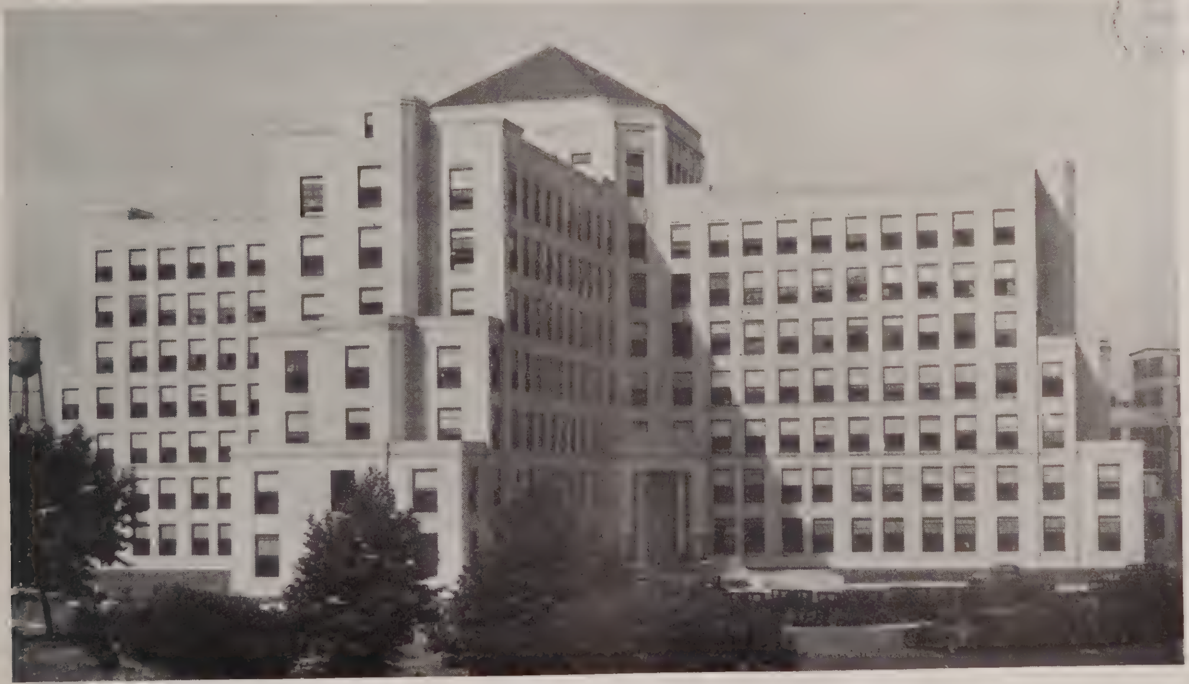
THE BALDWIN LOCOMOTIVE WORKS OFFICE BUILDING

SIMON & SIMON, ARCHITECTS

WHEN the management of the Baldwin Locomotive Works decided to transfer its entire plant and general offices from an intensely developed 20-acre location in central Philadelphia to a new 600-acre site in Eddystone, the housing of the executive, administrative, engineering and clerical departments presented a special problem. In order that the solution might be made with the benefit of thorough study and professional knowledge, this problem was turned over to an architectural and engineering organization. After research in the subject, the architects drew up a program for the project.

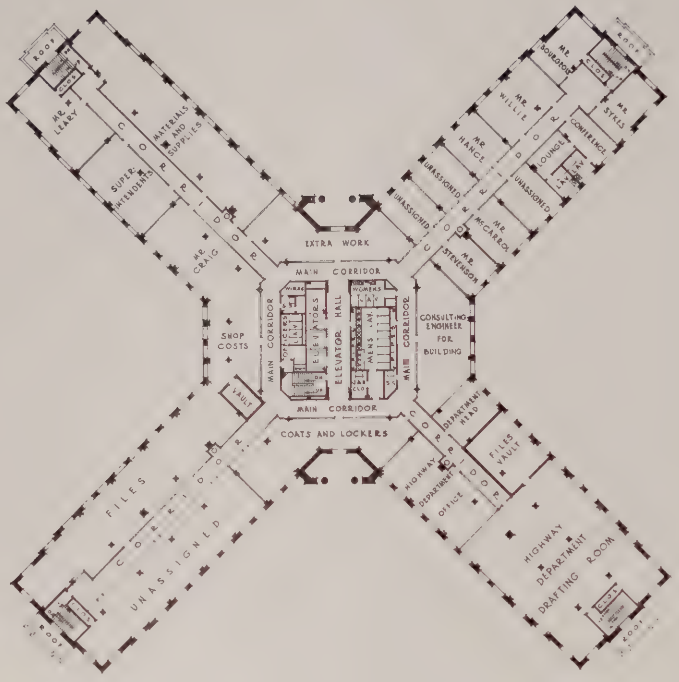
The unusual form which the building assumed in the solution of this program can be best explained through a summary of the preliminary study. From the clients the architects obtained statistics from which graphs were prepared showing the sales and volume of the company's manufacture as well as the number of its employes over a period of years. An analysis was made of the present organization, beginning with an organization chart and ending with a study of areas and personnel by departments. A questionnaire designed to determine the future activity of departments was submitted to the management, and its findings were tabulated and compared with a similar estimate made by the architects, their study being based on present maximum, and probable future criteria for each department. From these it was possible to determine the area necessary for the personnel to be accommodated and the spacial requirements for each department. The ideal department location was considered in relation to the building and also to other departments, including the manufacturing plant. From the inter-departmental studies the subjects of entrances and circulation areas were given consideration.

As the land was of only moderate value, it followed that the building might take whatever shape or area its program required. Block plans of different shapes were analyzed with reference to ratio of net to gross areas, maximum travel across the building and the length of enclosing walls. The Greek cross plan selected showed a gross area of 25,500 square feet of which 85 per cent was net usable area as compared with 28,600 square feet with 68 per cent net for a hollow square plan and 27,500 square feet with 80 per cent net for an "H" plan. The maximum travel across the building for the three schemes was 256 feet for the cross, 272 feet for the hollow square, and 360 feet for

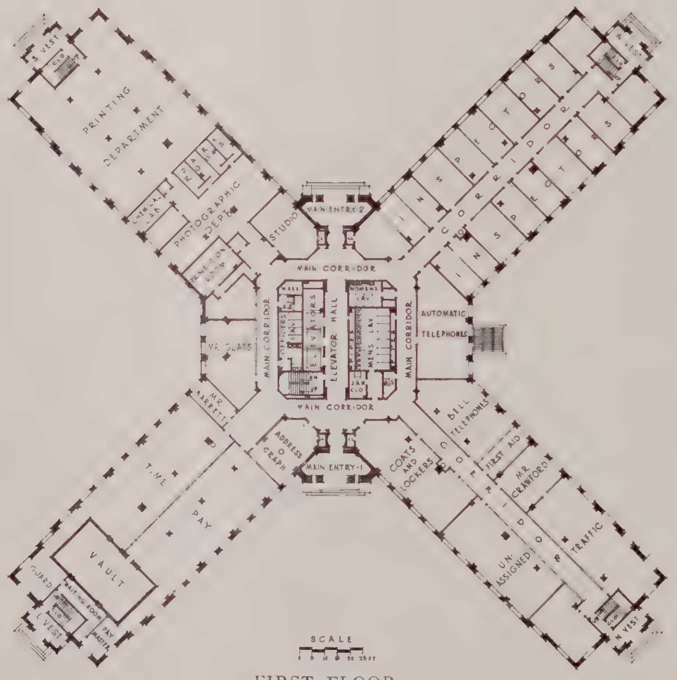


Photos. Richard T. Dooner

Baldwin Locomotive Works, Eddystone. Pa.
Simon & Simon, Architects

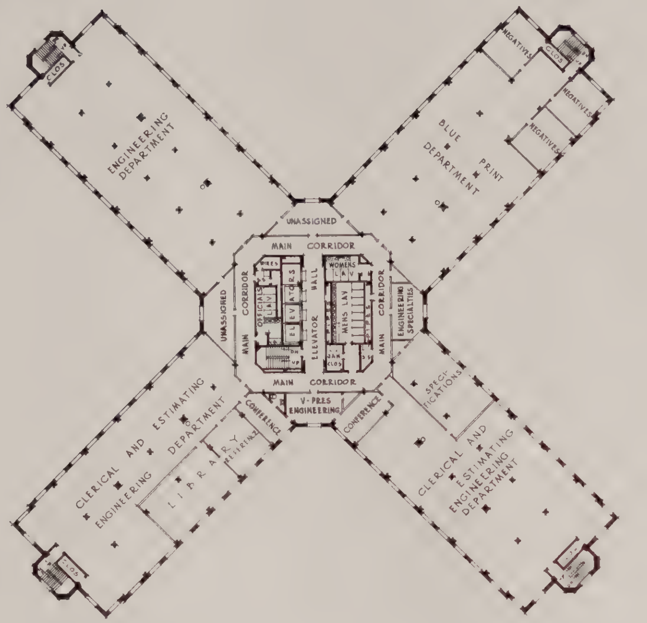


SECOND FLOOR

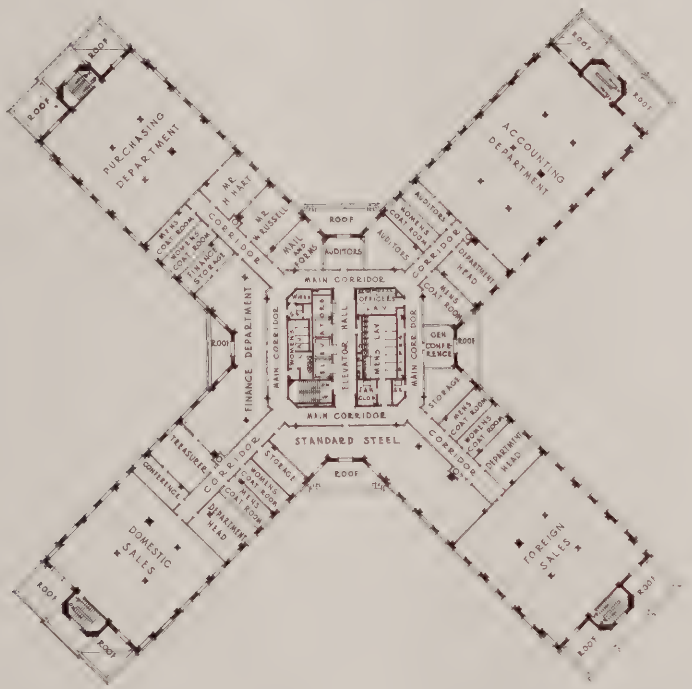


FIRST FLOOR

PLANS. BALDWIN LOCOMOTIVE WORKS, EDDYSTONE, PA.
SIMON & SIMON, ARCHITECTS

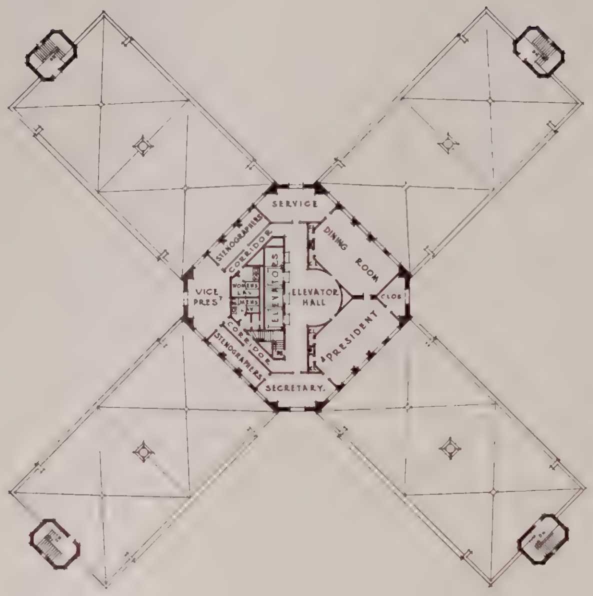


FOURTH FLOOR

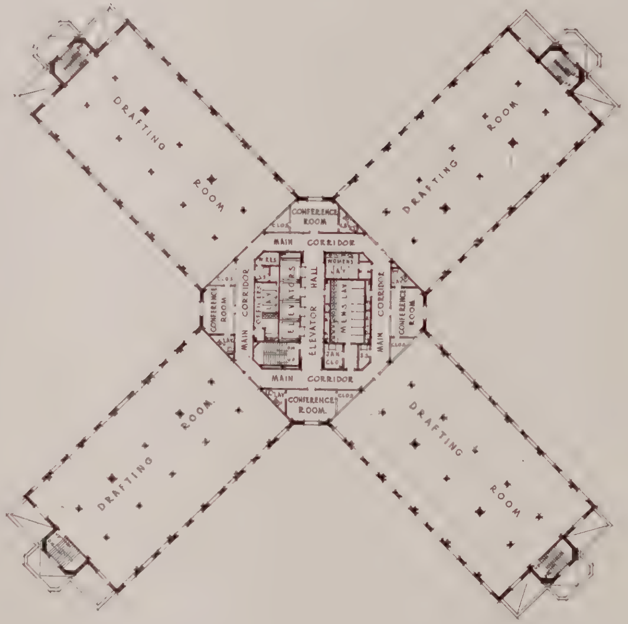


THIRD FLOOR

PLANS. BALDWIN LOCOMOTIVE WORKS, EDDYSTONE, PA.
SIMON & SIMON, ARCHITECTS

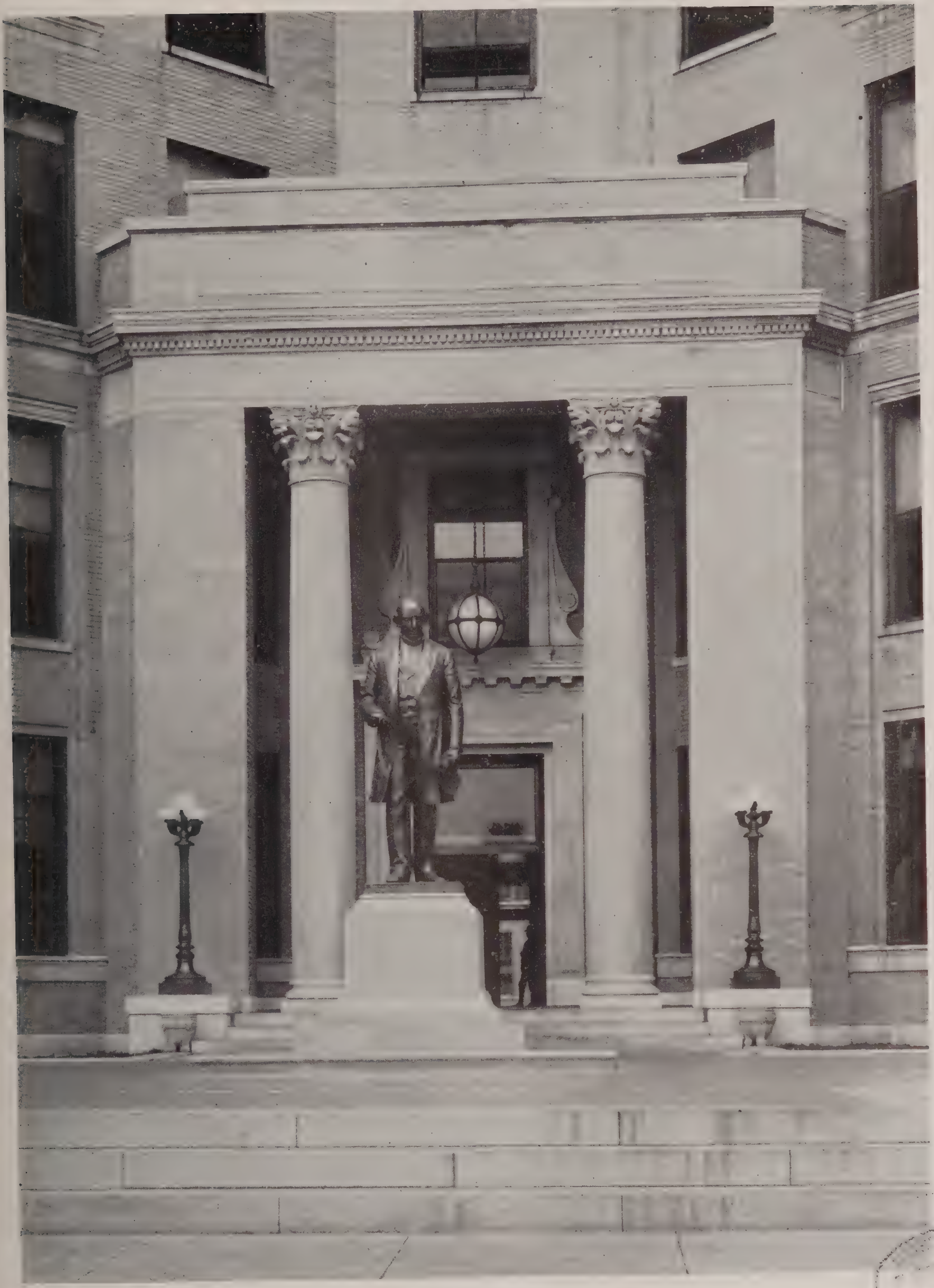


EIGHTH FLOOR AND ROOF



FIFTH, SIXTH AND SEVENTH FLOORS

PLANS. BALDWIN LOCOMOTIVE WORKS, EDDYSTONE, PA.
SIMON & SIMON, ARCHITECTS



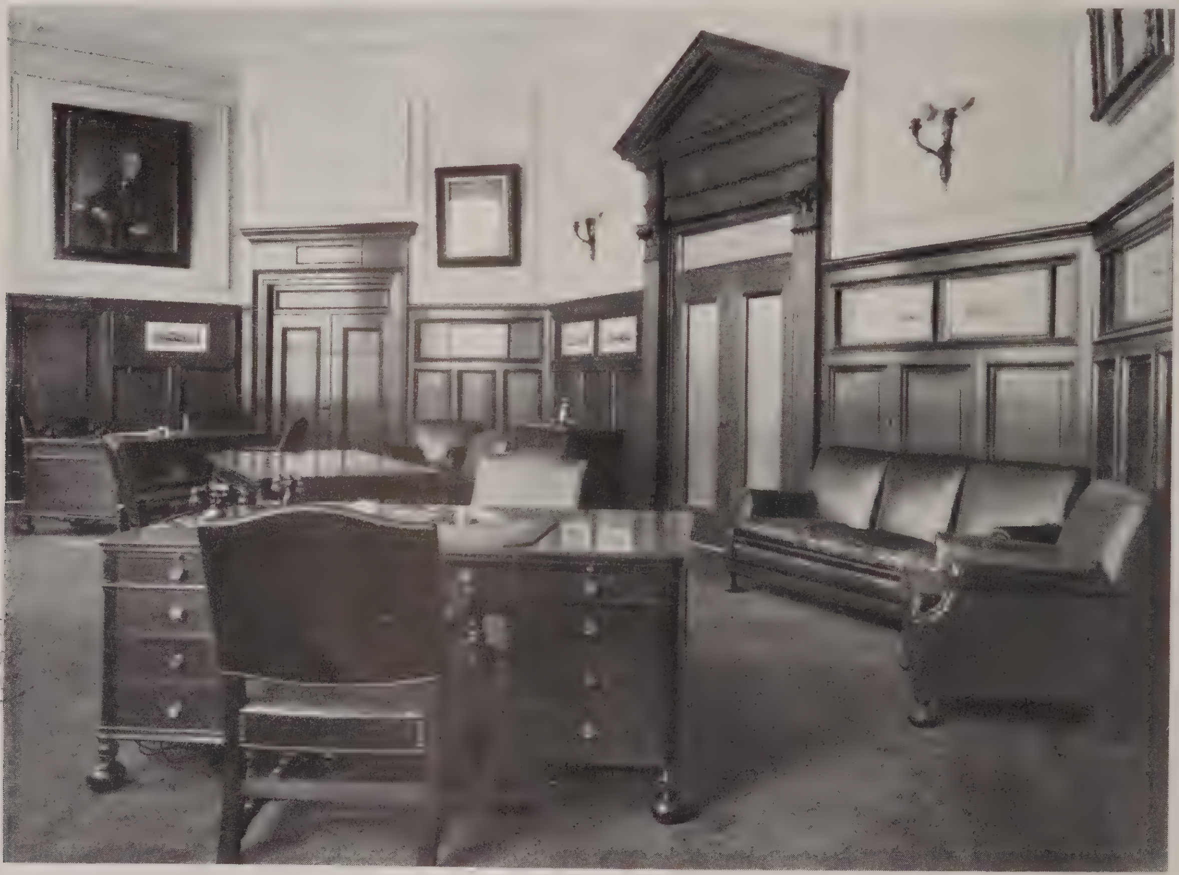
MAIN ENTRANCE
BALDWIN LOCOMOTIVE WORKS, EDDYSTONE, PA.
SIMON & SIMON, ARCHITECTS

the "H" plan. The advantages of natural light and ventilation given by the cross plan presented additional points in its favor. It also affords the desirable relationships of departments, supplies centralized access and communication by a convenient grouping of elevators, and gives a positive control of traffic throughout the building.

The arrangement of the floors follows the requirements of the program. The first floor is devoted to those departments which the shopmen have most occasion to use,—the inspection, transportation, time and pay departments. The second floor houses the officials and staffs which have supervision of manufacturing and plant maintenance. On the third floor are located foreign and domestic sales, the purchasing, financial and accounting departments. From the fourth to the seventh floors inclusive are housed the engineering department and drafting rooms, with the engineering executive offices and the sections for estimating, specifications, blueprinting and engineering clerical work on the fourth. The general executive suite, on the eighth floor, contains the Eddystone offices of the president, secretary and treasurer, with their clerical staffs.

Foundations rest on concrete caissons carried down to rock. The structure is of fireproofed steel, the exterior veneer being of brick and terra cotta with the entrance detail of granite. The depth of the wings of the building is 52 feet, 11½ inches, and the length from extremity of wing to extremity of opposite wing is 315 feet, 6 inches. The total usable or office floor area exceeds 154,000 square feet, and the gross floor area, including building utilities, stairways, corridors, lobbies and elevator shafts, is slightly in excess of 200,000 square feet. The principal entrances are two in number, in the northeast and southwest re-entrants between wings of the building. Additional access for emergency use is provided by four stairways, with outside exits.

The mass of the structure developed in an interesting manner, as departments were superimposed one upon another. From the first floor, accommodating the general shop departments, up through the other departments to the executive offices in the top of the central tower, the allotment of the required space has led to floors of diminishing areas, which results in use of the pyramidal or "set back" form of composition.



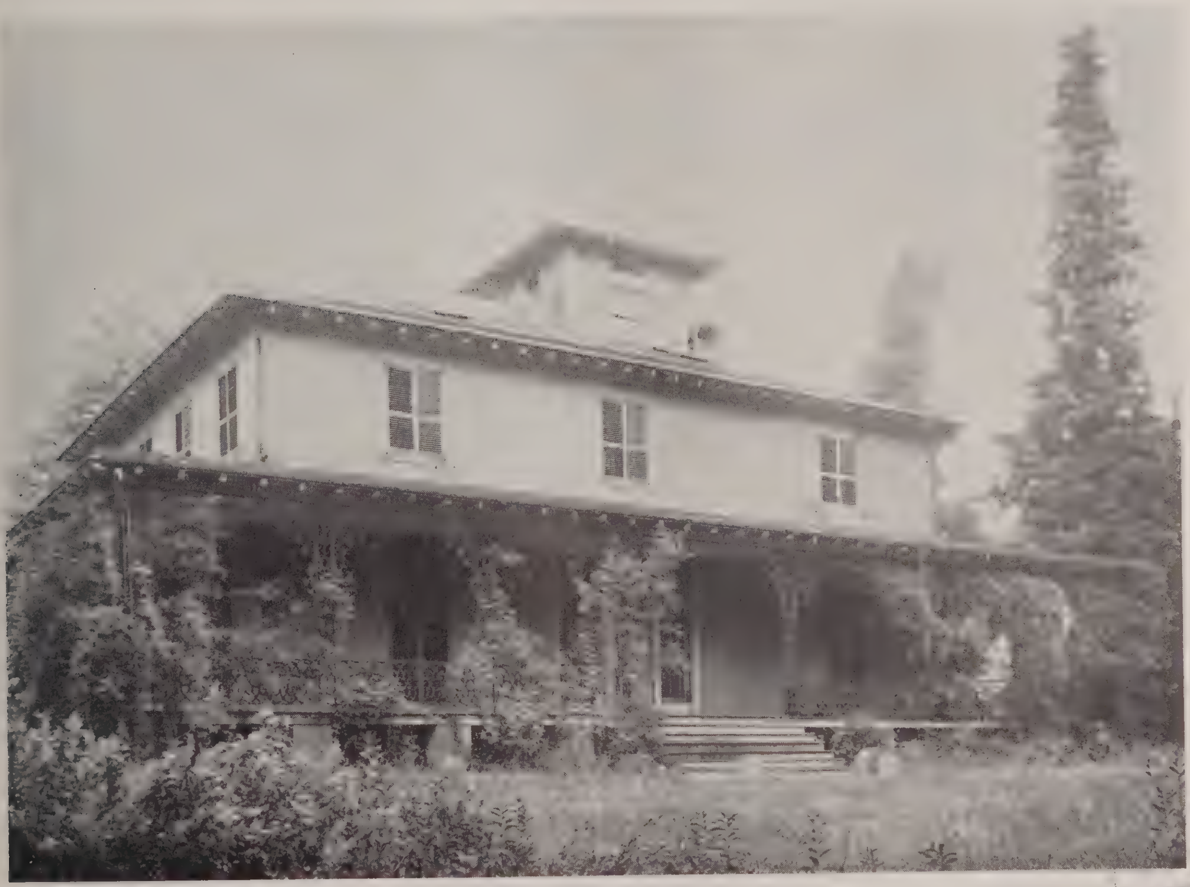
President's Office
Baldwin Locomotive Works, Eddystone, Pa.
Simon & Simon, Architects

RESTORATION OF "KENWOOD," A REGENCY HOUSE

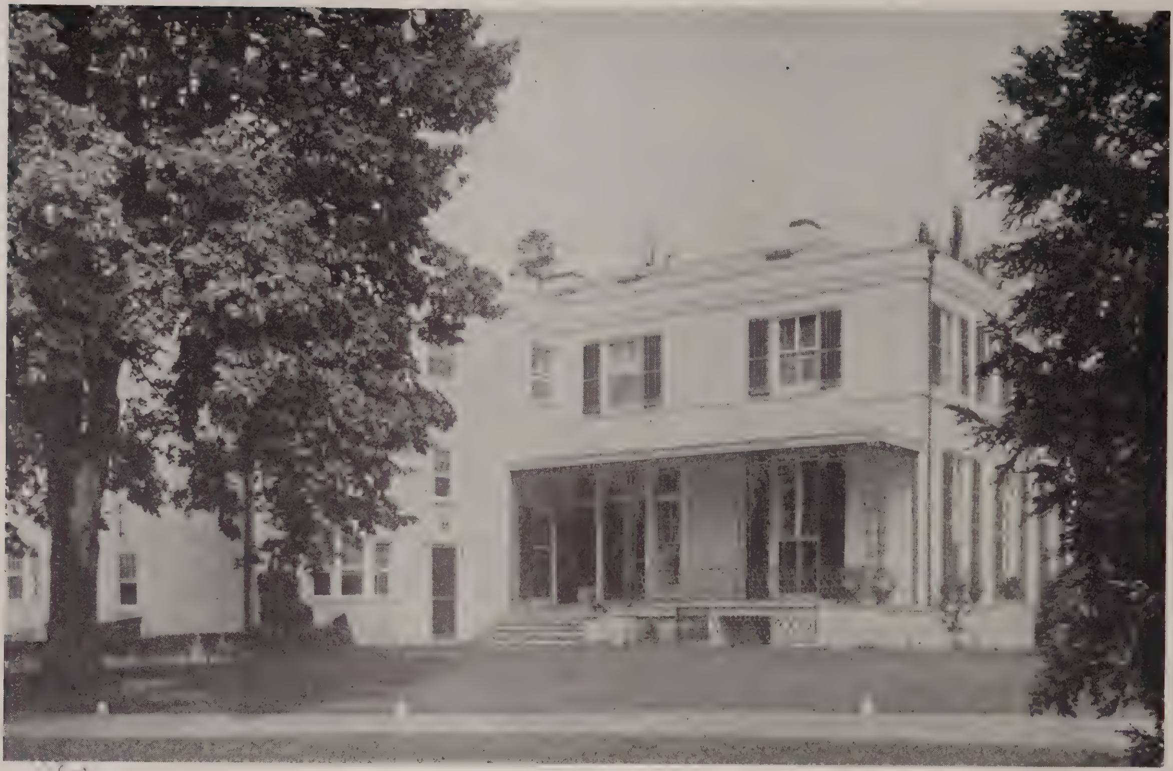
LEIGH FRENCH, JR., ARCHITECT; HAROLD D. EBERLEIN, ASSOCIATED

AT Bethayres in the Huntingdon Valley just outside of Philadelphia, "Kenwood," is a country house recently remodeled and added to for the fourth time within a century and a quarter. In its present form it is also a restoration to the manner indicated at the first remodeling about 1810, a manner more or less in accordance with which the two next changes and enlargements were carried out about 1830 and 1840. This manner, in spite of the debased form of a waning tradition in vogue at the date of the last named structural change, and in spite of sundry later Victorian mutilations, was still evident enough to suggest the course for the work recently completed. It is of interest to note that wherever demolition became necessary in the process of reconstruction, traces were constantly coming to light of good things that had been obliterated and forgotten or else built over and hidden from sight.

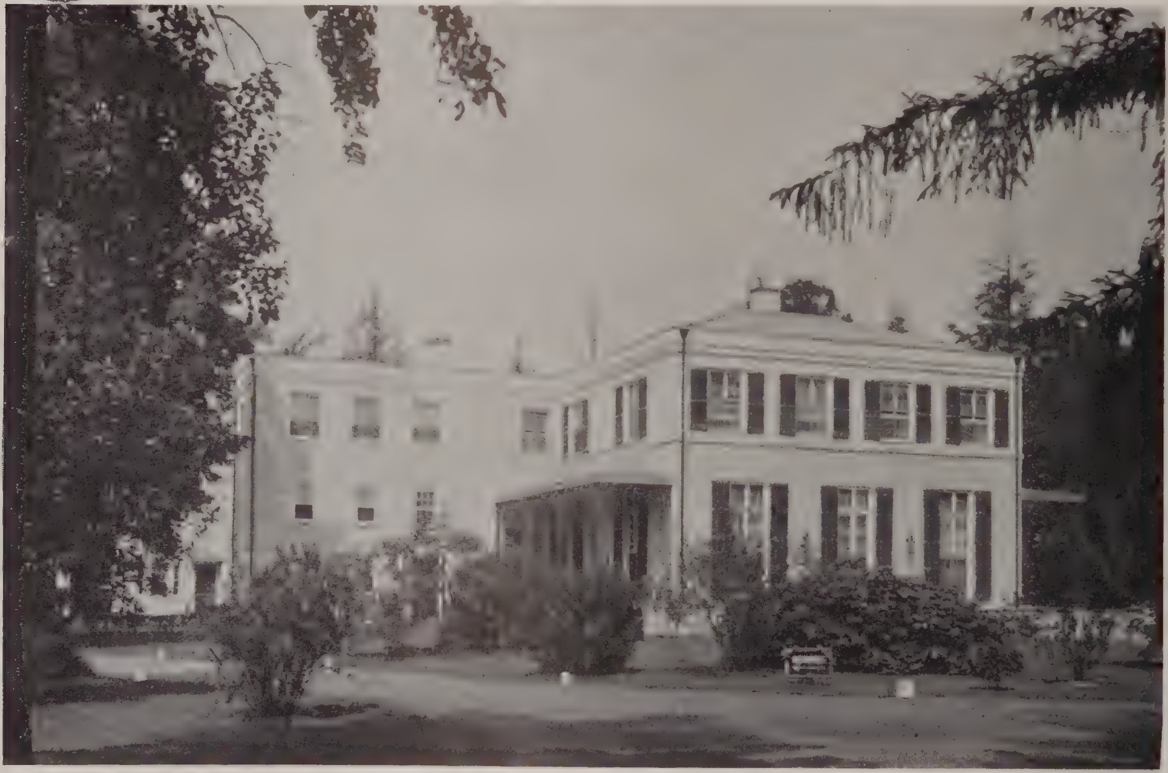
The original house, incorporated in a part of the present servants' wing, was built about 1708. Just what its aspect may have been, we can now only conjecture. It was a small, staunchly built stone structure, and in all likelihood was much the same as any other little Pennsylvania stone farmhouse of the period. All its pristine character disappeared at the time of the first remodeling and addition, about 1810, when the exterior, it seems, was first coated with stucco, and when the mantelpieces, doors, shutters and all other interior and exterior woodwork were changed to conform with the prevailing mode of the time. The manner of the time, of course, was the Regency or Græco-Roman manner of the early nineteenth century, of which Latrobe, Robert Mills, Strickland and the rest of the coterie who followed in Latrobe's wake were the apostles,—a manner of neo-Classic interpretation that had begun in England somewhat earlier with Henry Holland, was carried on by Nash, Papworth, Cockerell, Mylne, Foulston and others, and reached its full maturity during the regency and



"Kenwood," Bethayres, Pa.
The appearance of the building before the recent remodeling



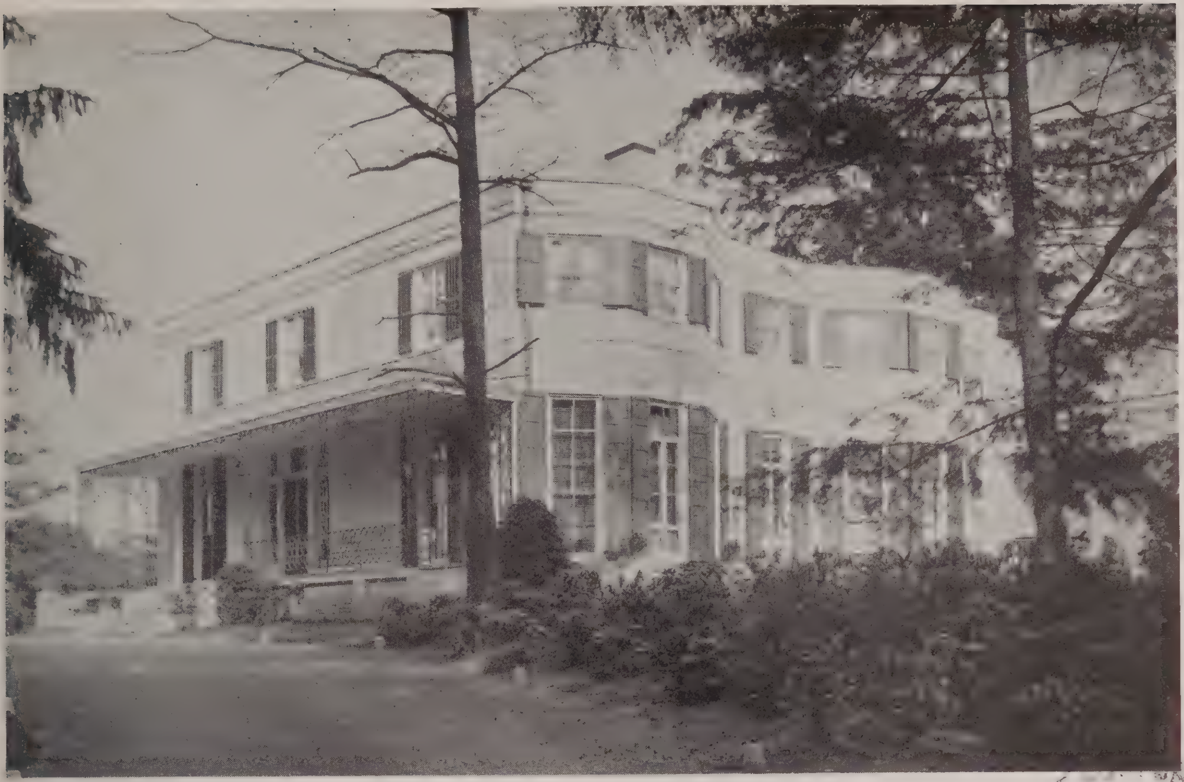
SOUTH FRONT AND SERVICE WING



EAST FRONT AND SERVICE WING

"KENWOOD," BETHAYRES, PA.

LEIGH FRENCH, JR., ARCHITECT; HAROLD D. EBERLEIN, ASSOCIATED



NORTH AND WEST FRONTS FROM DRIVEWAY

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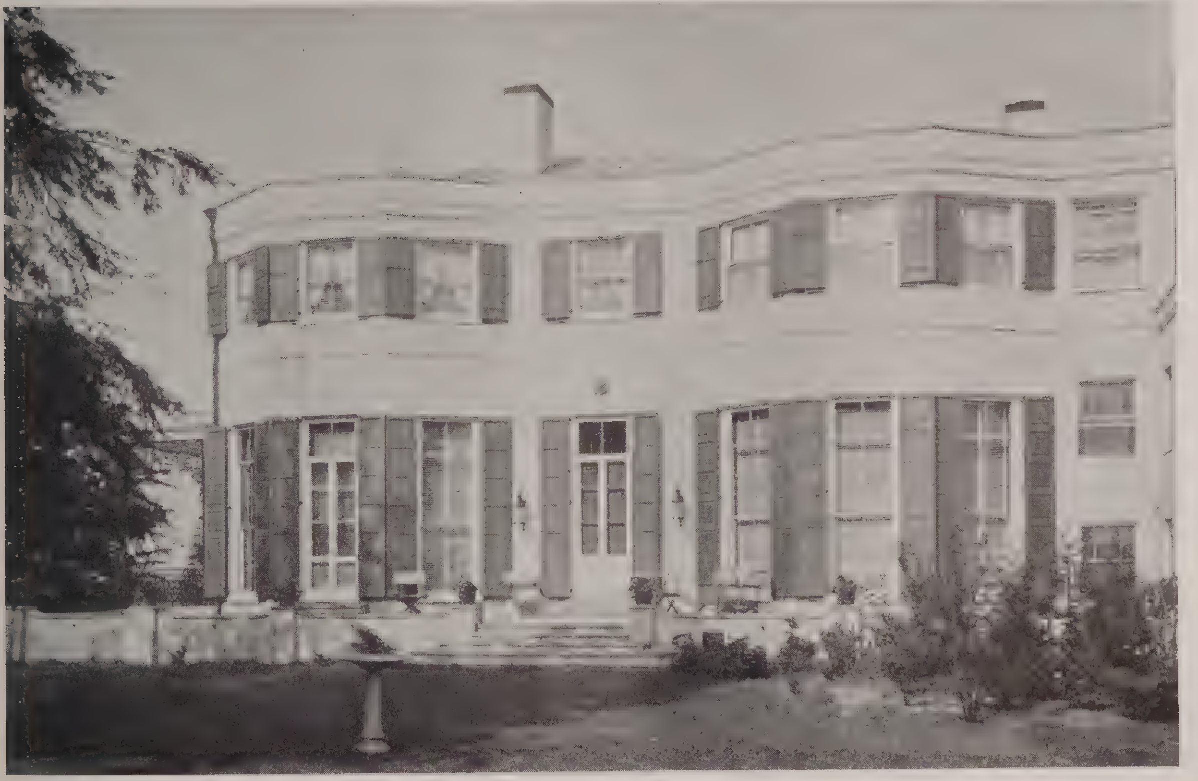
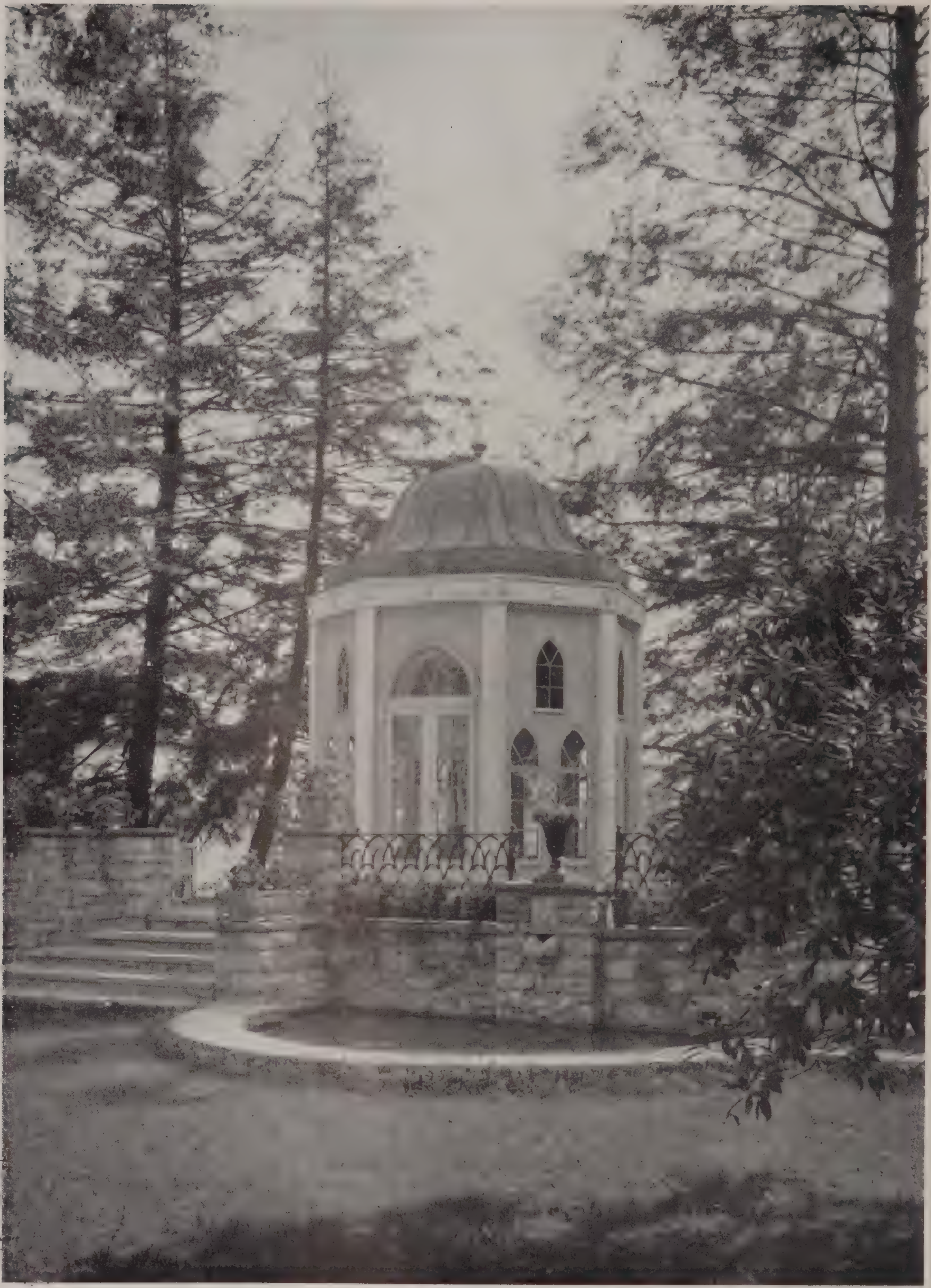


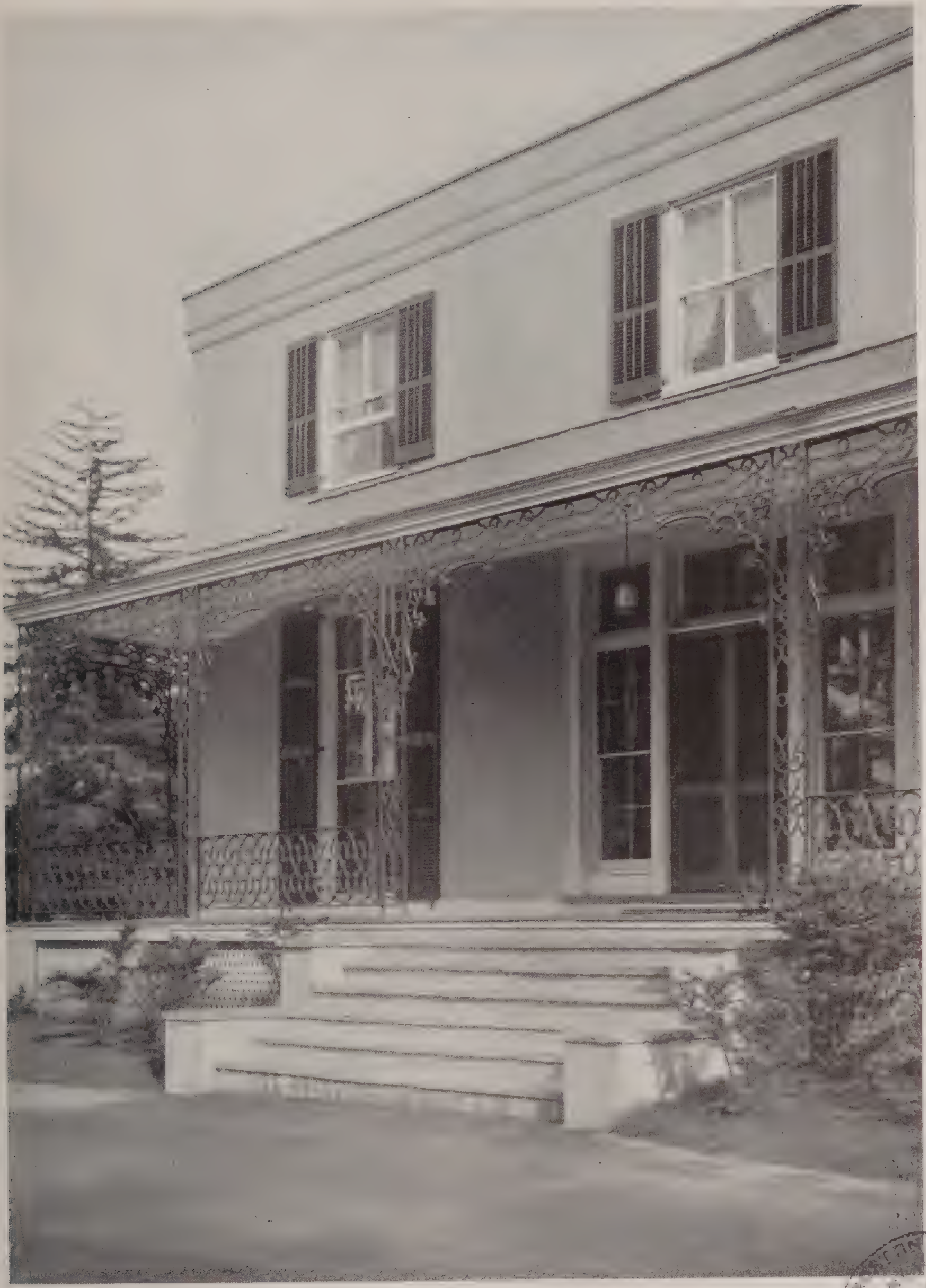
WEST FRONT

"KENWOOD," BETHAYRES, PA.

LEIGH FRENCH, JR., ARCHITECT; HAROLD D. EBERLEIN, ASSOCIATED



"GAZEBO," TERRACE AND FISH POOL
"KENWOOD," BETHAYRES, PA.
LEIGH FRENCH, JR., ARCHITECT; HAROLD D. EBERLEIN, ASSOCIATED



NORTH DOORWAY
"KENWOOD," BETHAYRES, PA.
LEIGH FRENCH, JR., ARCHITECT; HAROLD D. EBERLEIN, ASSOCIATED

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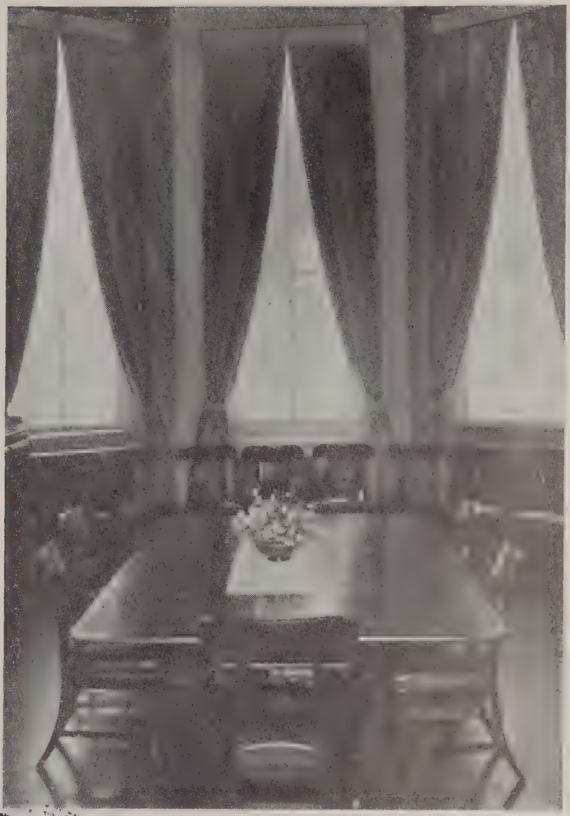
reign of George IV,—and hence the name.

The dining room at Kenwood, occupying most of the area of the present dining room, was built at the time of the first remodeling. The next addition took in the library, with its semi-hexagon end, and the space between the library and dining room now taken up by the stair hall. The final addition completed the outward structure of the main body of the house as it stands today. At this time the verandas were built and equipped with cast iron fretwork supports. The oldest part of the house and the dining room addition of the early nineteenth century were all on the same level. The second and third additions had a ground floor level 3 feet higher. These levels have been retained. Upstairs, the floor levels after the third enlargement did all sorts of strange things, and to go from one part of the house to another was like following the course of a roller coaster. All changes subsequent to the third enlargement were interior alterations of little consequence so far as the structure was concerned.

Several of the accompanying illustrations give some idea of the outside of the house as it appeared after it had been unoccupied for 20 years and just before the recent remodeling was undertaken. At this stage, inside there was a splendidly proportioned drawing room, 36 feet long by 17 feet wide, with a ceiling slightly more than 13



Dining Room

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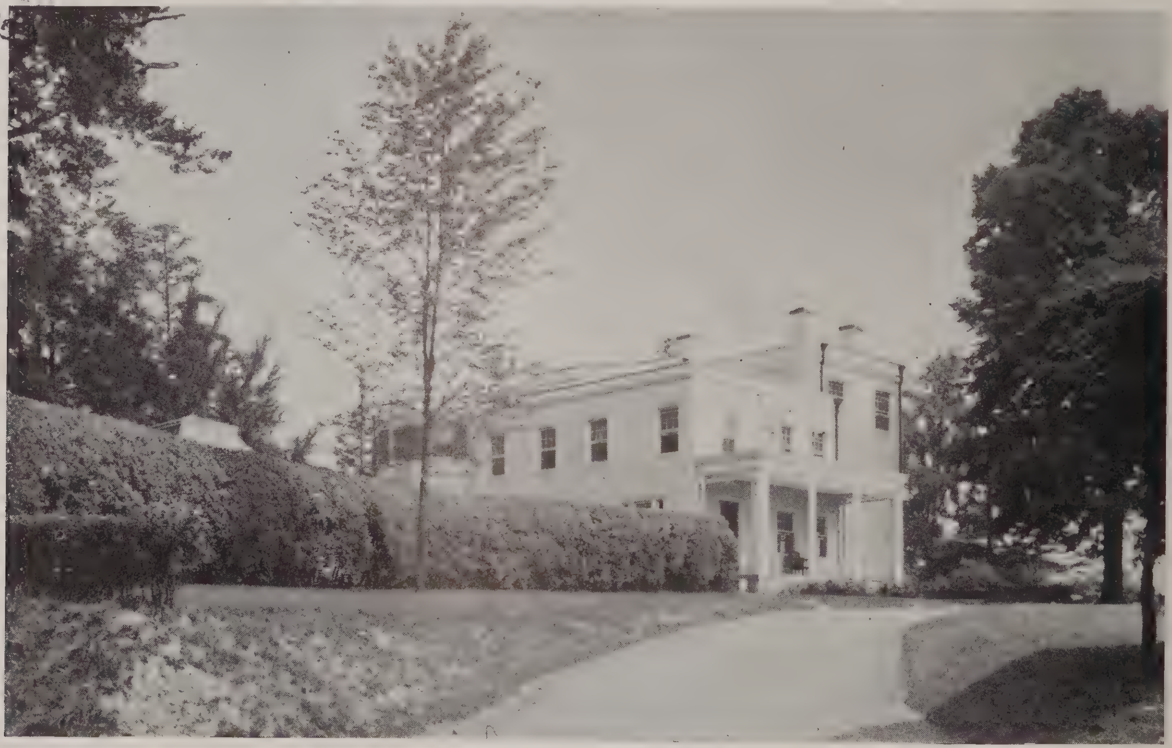


Service Wing

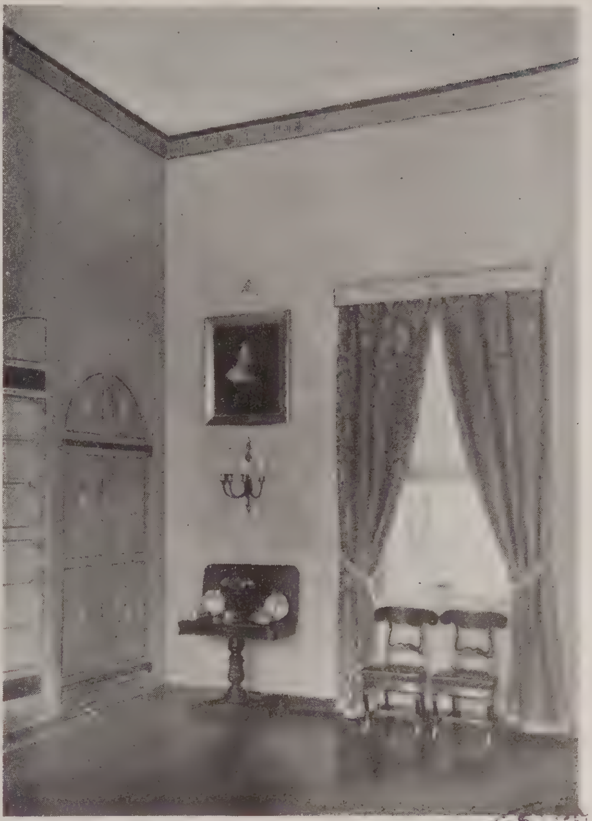
"Kenwood," Bethayres, Pa.

Leigh French, Jr., Architect; Harold D. Eberlein, Associated

feet high; there were five full length windows, nearly 11 feet high, with triple-hung sash, three on the long east side, and one each at the north and south ends. There was also a long hall, 36 feet long and 12 feet wide, running through the house from the north door to the south door. In both the drawing room and the long hall the plaster decorations were of excellent character and in good condition. The library, to the west of the long hall, was 27 feet long to the extremity of the half-hexagon bay, and in width a little more than the width of the bay.

The exterior changes were more radical in appearance than in actual fact. The eaves were sheared off, and a parapet was substituted in such a manner that the low part of the gutter is only a few inches below the coping, so that there is no difficulty with snow lodging in a deep pocket; the veranda was removed from the east side, and a flag-paved terrace was built in its stead, corresponding with the flag-paved terrace added on the west side, which never had a veranda; and the north and south verandas were slightly narrowed and re-roofed with tin with standing seams.

Inside the house, the stair hall is paved with black slate, and the stairs,—of one continuous run, which ascends in an elongated oval,—are also of black slate, polished. The balustrade is of wrought iron with a polished brass handrail,



One End of Dining Room

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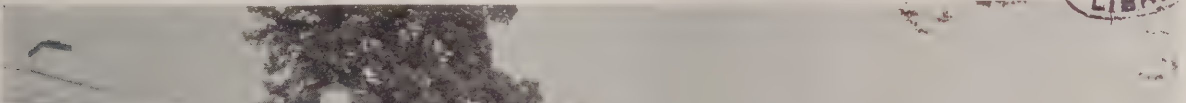

New Part of Service Wing
"Kenwood," Bethayres, Pa.
Leigh French, Jr., Architect; Harold D. Eberlein, Associated

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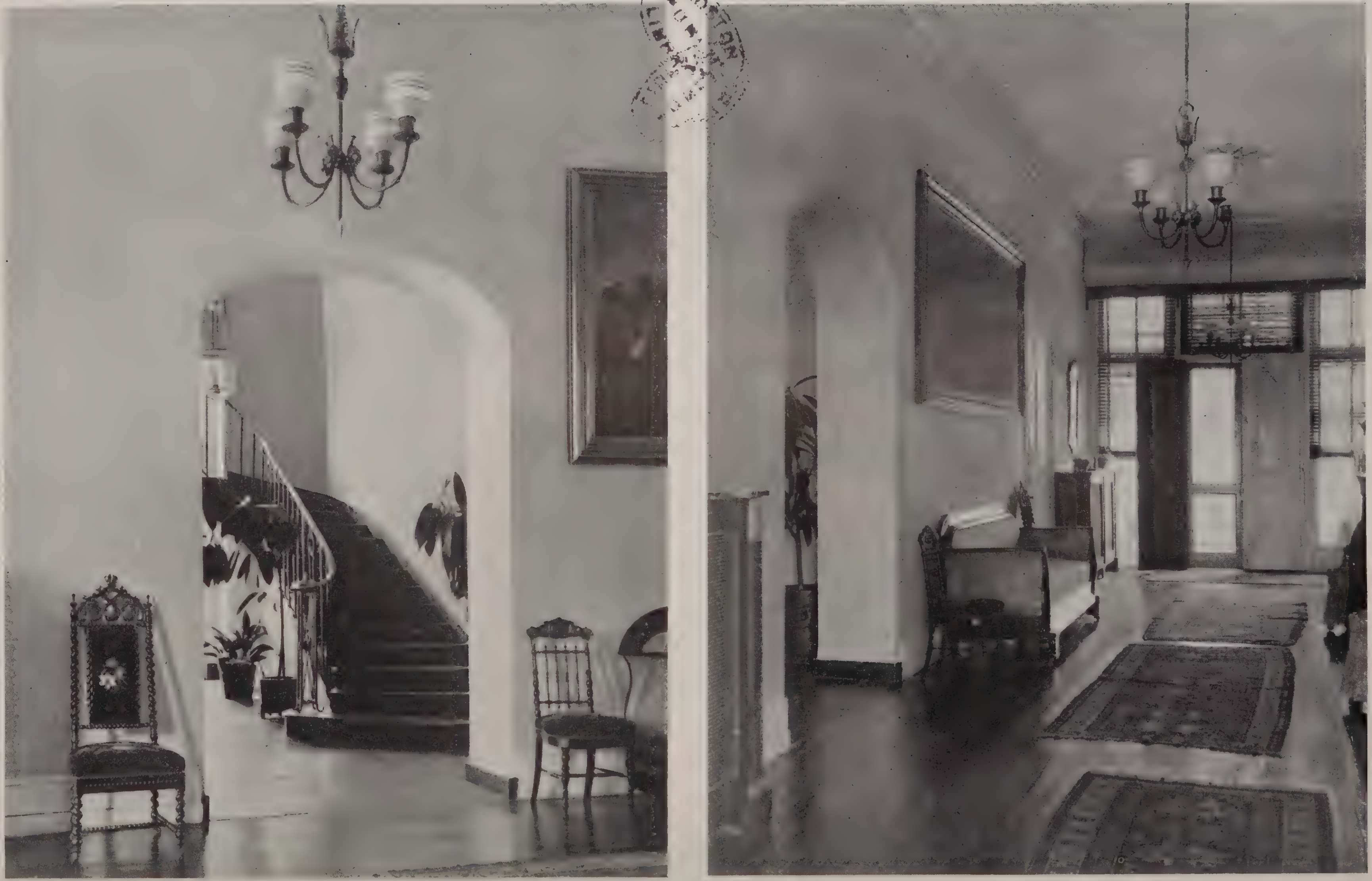
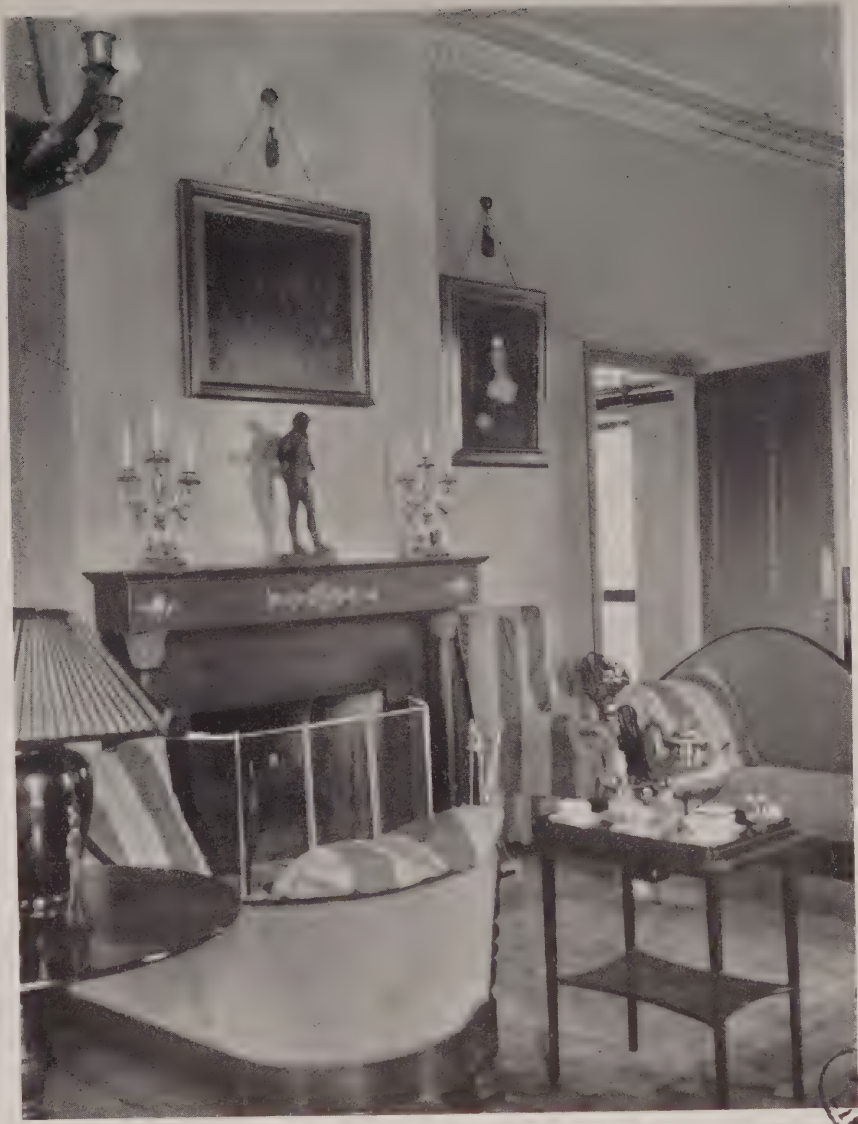


STAIR HALL

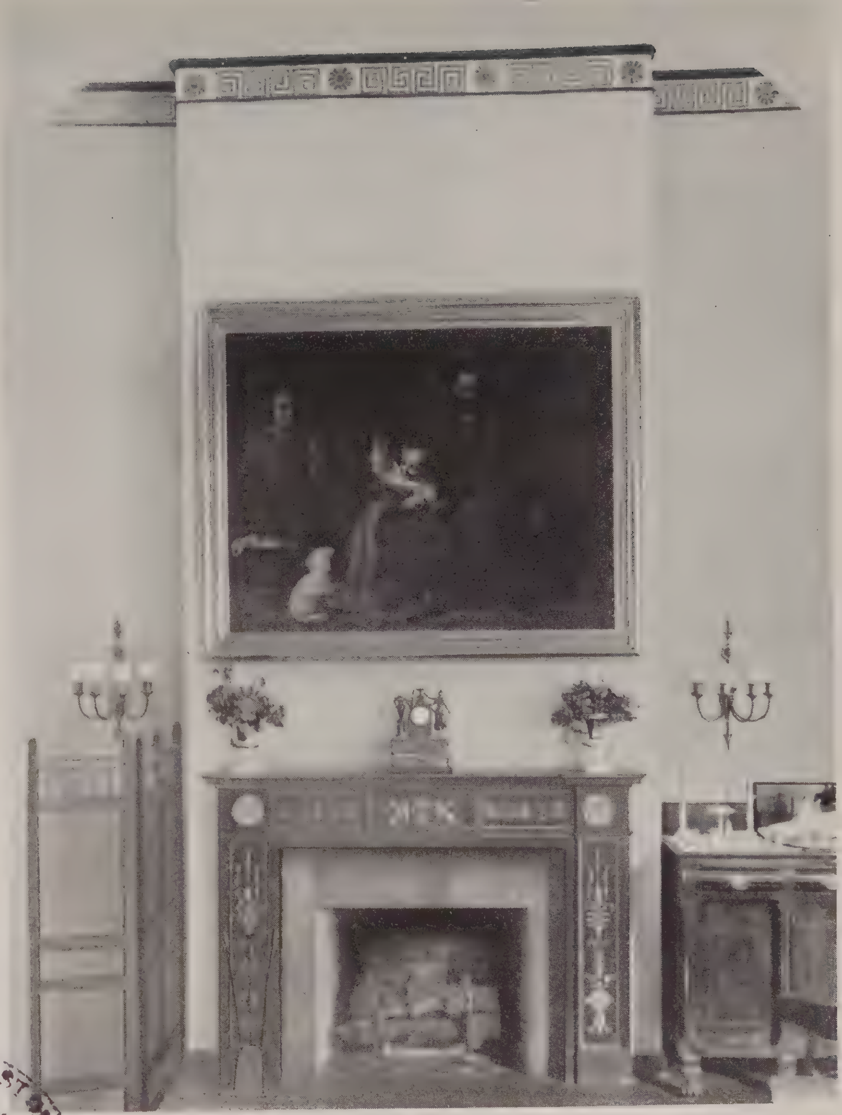
MAIN HALL

"KENWOOD," BETHAYRES, PA.

LEIGH FRENCH, JR., ARCHITECT; HAROLD D. EBERLEIN, ASSOCIATED



DRAWING ROOM FIREPLACE



DINING ROOM FIREPLACE

"KENWOOD," BETHAYRES, PA.
LEIGH FRENCH, JR., ARCHITECT; HAROLD D. EBERLEIN, ASSOCIATED

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and the newel post has a polished brass cap surmounted by a crystal ball. In the stair hall the landing of the upper floor is likewise paved with black slate. The base is of black slate, and the walls are painted a cool sea-green, the window reveals and the jambs and soffits of the arches being white; the ceiling is white, and the cornice is gilded with black fillets.

The dining room, 3 feet lower than the stair hall, is paved with black terrazzo, and there is a 4-inch base of black marble lined with gold. The walls are painted apricot color, and the woodwork is a rather light peacock green-blue lined with jade green, a lighter tone of the same peacock green-blue being used for the ceiling, which is studded with small gold stars. The cornice is composed of rope, first saturated with black paint and then put in place; the frieze consists of Greek key-frets and roundels painted in gold. There is no wood trim around the central doorway or the arches of the two flanking china cupboards; the heavy unpaneled doors are hung flush with the plaster surface of the wall, and the straps of the stout iron hinges are incorporated in the scheme of the painted decoration of the doors. These decorations are in light jade green, white, gold, black and old rose on the peacock green-blue of the groundwork. The same scheme is continued in the painted cornices from which the curtains hang, and the curtains themselves are of old Italian rose damask brocaded in silver, with green-blue fringes. The Venetian blinds are white.

In the library the walls are painted a light yellow, with all the woodwork a deeper tone of yellow lined with gold, and the Venetian blinds are the yellow of the walls. The curtains are of scarlet damask brocaded with a small gold pattern and fringed with apple-green matching the apple-green ground of the cornices, which are lozenge-hatched with black lines, with gold quatrefoils at the intersections. In the drawing room the woodwork is painted a dark gray-blue; the walls are of Chinese pink, affording an appropriate background for early nineteenth century portraits, and the curtains are of brilliant yellow damask hanging from black cornices with classic gold ornament in relief. Here, as elsewhere, the cornices are of simple carpenter's make painted, with the compo ornaments applied and gilded. The mantel is likewise an unpretentious piece of millwork.

North Front of Barn, Unaltered
"Kenwood," Bethayres, Pa.

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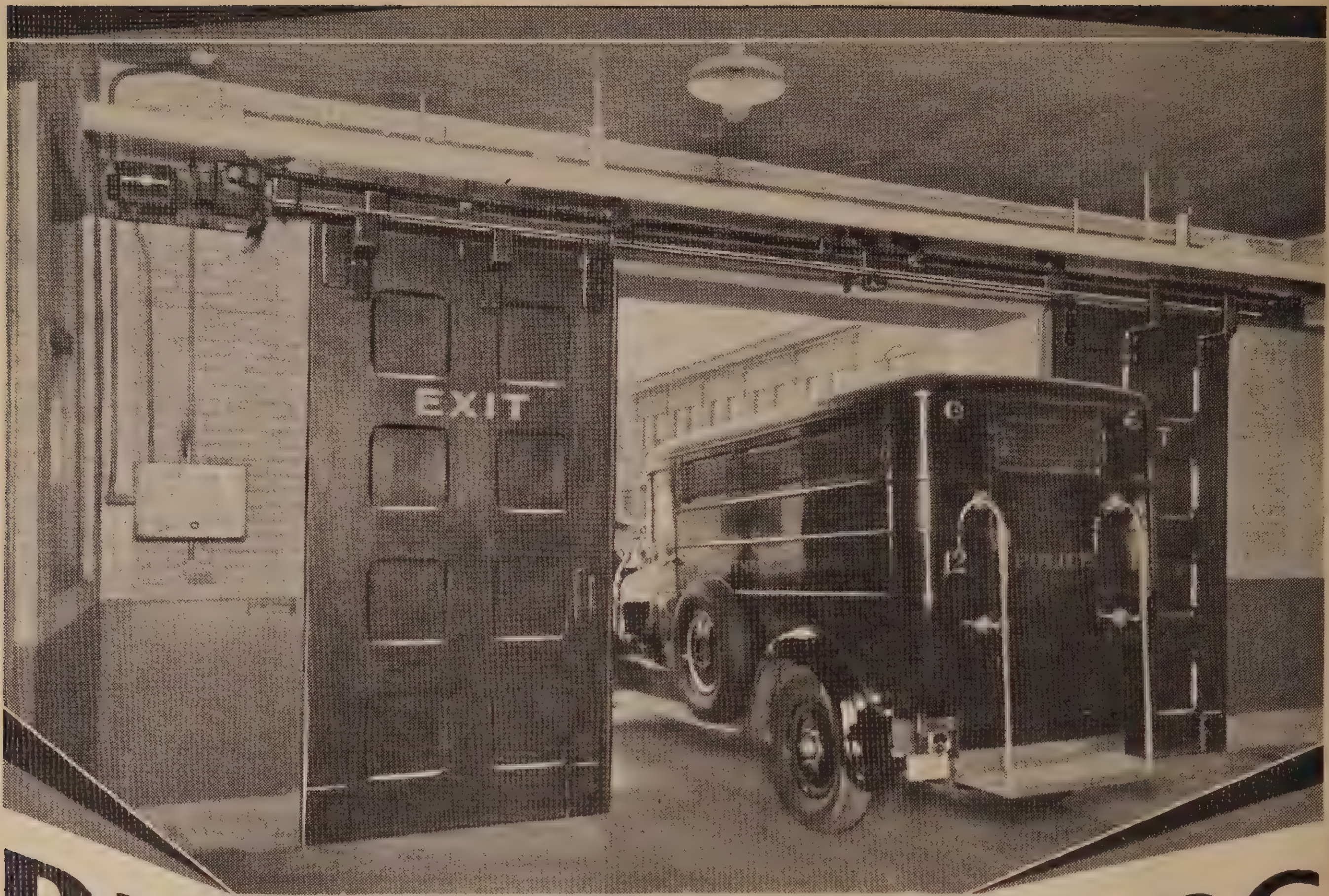

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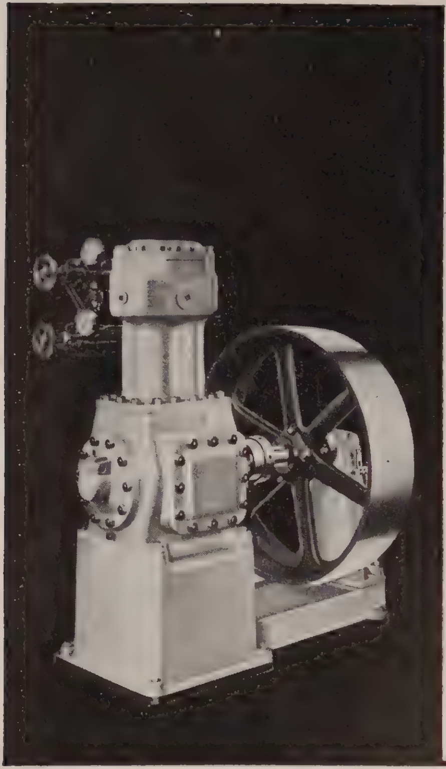

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CONCRETE, PLAIN AND REINFORCED

A REVIEW BY

CLIFFORD WAYNE SPENCER

THE sole limitation to structural extent in architecture has always been the strength of the materials used in construction, although legend implies that the Tower of Babel would surely have reached the heavens had it not been for the confusion of tongues. We of the present day, however much we may marvel at the skill of the ancient builders and the sizes and staunchness of their structures, know that the materials with which they had to work imposed a very definite limitation on the height to which their structures could be carried. Man in his building has always striven for greater height, and in the effort to attain it he has gradually worked out new methods of disposing the materials at hand in such a way that their strength be utilized to the greatest possible advantage. The Romans by developing the arch accomplished much in this direction, but even with use of this clever device the utmost limit to which stone and wood could arise was attained in the Gothic cathedrals of the middle ages, and it was not until the latter part of the nineteenth century that any further progress in this direction was made,—the beginning of what we call "steel construction."

During the period just preceding the invention of the skyscraper, the tendency of people, especially in America, to congregate in limited areas gave a fresh impetus to the attempts to build larger and taller structures. In these attempts it was found that the old materials were quite inadequate. If a structure of more than ten stories were built of masonry, it was found necessary to make the lower walls so massive as to cause them to occupy nearly the whole floor area, and though several such structures were actually built, it soon became evident that they were quite unsatisfactory from an economic point of view. It was at this point that the introduction of the new materials,—structural steel and concrete,—made possible the development of the skyscraper as we know it today. As our modern materials are superior to those of the ancients in strength and utility, so is our

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EDITED BY

C. STANLEY TAYLOR and VINCENT R. BLISS

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The editors have been assisted in the preparation of the work by widely known hotel architects and interior decorators and by actual operators of hotels,—practical men, experienced in the management of the "back" as well as the "front" of a hotel. The volume's treatment of hotel furnishing and equipping constitutes the final word on this important subject. There are included views of hotel restaurants, cafeterias, kitchens, pantries, "serving pantries," refrigerating plants and all the departments which are necessary in a modern hotel of any type. The work is of inestimable value to architects and engineers, as well as to practical hotel men.

438 pages, 8½ x 11¼ inches—Price $10

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knowledge of the principles underlying their use superior to the science available to the ancient builders, and as our structures become larger and more and more complicated, a greater degree of scientific knowledge is necessary for their safe construction. In the designing of steel framework, modern engineers have attained an amazing proficiency which has been manifested in great buildings and bridges everywhere.

Although it is of course purely a matter of opinion, there is every reason to suppose that the outstanding building material of the future will be ferro-concrete, and one has but to study some of the great modern churches and public structures which have been built of this material to realize how great is the potentiality for beauty and strength latent therein. The possibility of spanning enormous spaces with great parabolic arches in reinforced concrete is being utilized extensively, especially in Europe, and it is difficult to predict to what undreamed of proportions the buildings of the future may attain. At all events, it is quite safe to say that the successful architect of the future will be the man who knows his concrete. As the use of concrete has developed, there has grown up a considerable volume of published material on the subject, there being many excellent works dealing with all phases of the science of building in concrete. One of the recognized standard works in this field is "Concrete, Plain and Reinforced," written by Frederick W. Taylor and Sanford E. Thompson, but as is the case with all new and rapidly developing sciences, new theories and facts are constantly being discovered and applied, and the work has recently been brought up-to-date and rewritten by these authors and by Edward Smulski. The new edition, which is the fourth, is in four volumes, the second volume being the subject of this review. Volume I, already issued, deals with concrete and reinforced concrete structures from the standpoint of design, while Volume II goes still more deeply into the technical and practical aspects of the subject and covers the theory and design of continuous beams, frames, building frames and arches. Taken altogether, the two volumes comprise one of the best and most comprehensive treatises ever published on the subject. Data on continuous beams as specified in the findings of joint committees and in various building codes are given for ideal conditions where the spans of the beams are equal and the loading uniformly distributed. In all other cases, understanding of the action of continuous beams and of the principles upon which formulæ can be based is essential for the intelligent designing of concrete structures. In the chapter on continuous beams, formulæ and explanations governing a large variety of possible cases are given, and the findings are carefully tabulated. Maximum shears and bending moments for continuous beams up to four spans, with or without fixed ends, are given, and the influence of cantilevers on continuous beams is investigated. Also moments of inertia and their effect on continuous beams will supply much data of practical value to bridge engineers and others interested in the designing of beams with straight or parabolic haunches.

The practical application of the formulæ and principle presented is demonstrated by five actual problems worked out for various arrangements of continuous beams. This chapter may be considered the most complete treatment in any language of continuous beams

"International Airports"

By STEDMAN S. HANKS

Lieutenant-Colonel Air Corps Reserve

THE rapid development of commercial aëronautics is presenting to American architects what bids fair to becoming an excellent opportunity for using skill in designing, constructing and equipping airports. The subject has hitherto received but little attention in the architectural press, and but few works on the subject have been published.

* * *

In this volume a highly trained and experienced aëronaut reviews the subject. He considers the problems of American airport development from a study of what has been done abroad against the background of the author's intimate knowledge of airport conditions here. In its preparation, Colonel Hanks made a prolonged tour of European airports for the purpose of learning in what ways their experience can serve as a guide for airport construction in the United States.

* * *

In making his study he received the assistance of many leaders in European aëronautics and enjoyed exceptional facilities for thorough investigation. Much information on the details of foreign airport operation is accordingly given that has never before been available in published form. The design, construction, and management of the outstanding airports is described and compared with that of the airports in America. Up to the present time, Europe has led the world in air passenger traffic. Colonel Hanks discusses passenger facilities at airports, tickets, baggage regulations, transportation of passengers to and from airports, and other details of European passenger practice. He considers also the problem of developing the transportation of freight by air and tells what has been done in Germany in the inauguration of combination air and rail service for express shipments.

* * *

The opportunities for substantial additional revenue to the airport from supplying recreational facilities and other adjuncts of the modern resort; an outline of an ideal airport combining the best features of successful American and European practice; a typical airport profit and loss statement; airport regulations; are other valuable features of this book.

195 pp., 5¾ x 8½ ins. Price $5.

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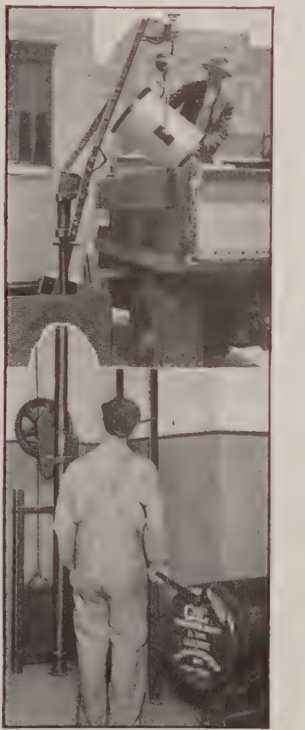

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with uniform moment of inertia, which are freely supported at intermediate points and either freely supported or fixed at the two end supports. The care of unequal spans for such beams is handled in usable form. The formulæ here given may be applied to the designing of concrete slabs, joists or beams upon a steel framework. They may not be properly applied to rectangular slabs, joists or beams built monolithically with concrete columns and girders as their intermediate supports, which is by far the more common practice in modern construction. The solutions also do not apply to T-beams where the moment of inertia at the center is often twice that at the support, but within the limited range in which they do apply, the solutions are exceptionally complete and usable. The treatment of the effect of varying moments of inertia starts with cases in which the I at the center of span is one fiftieth of that at the support and stops when they are equal. In actual building it is far more common that the I at the center of the span exceeds that at the support, since T-beams and T-joists are the usual flexural members employed in design.

The authors seem to have had the rectangular beam and the one-way slab, with or without brackets, chiefly in mind in this whole treatment. The method of computing the moment of inertia of a reinforced concrete member of flexure, as given, is satisfactory for preliminary design, but the final design should be more carefully worked out. The analysis of bending and direct compression is exceptionally complete for rectangular sections, though here, as in other parts of the work, departures from standard notation result in unnecessary confusion and delay to the reader. Many diagrams are saved by giving only those for N-15 and by supplying two simple conversion tables for other values of N. Circular sections are not discussed. Detailed solutions of many cases in the treatment of rigid frames are given and present much data that have heretofore been available chiefly in European texts. These are limited largely to structures of one or two panels in width, leaving the more common multi-bay building to be worked out by the general slope-deflection equations which are given. This portion of the book is very usable in both concrete and steel design, but it is a matter of regret that the great possibilities for a condensed treatment, more applicable to rapid design, have not been utilized. Four chapters are devoted to the treatment of rigid arches with simple, effective analysis and clear exposition of the basic structural action. Both approximate and exact methods are given.

The authors have planned the text so as to make it useful to the greatest possible number of persons, including students and professionals. For the student the theory and derivation of formulæ are given, while final formulæ are furnished for practical use. To take care of unusual cases, general formulæ are given, the more common cases being covered by simple final formulæ supplemented in many cases by constants and diagrams, the use of the formulæ being made clear in all cases by giving practical examples as illustrations.

Although the volume is a new edition of an already well known work, the material contained in the second volume is entirely new and is not contained in any of the previous issues. The authors believe that, "this is the first book in any language in which the subject of statically indeterminate structures has been fully treated

College Architecture in America

Its Part in the Development of the Campus

By

CHARLES Z. KLAUDER *and* HERBERT C. WISE

Music Building, Smith College
Delano & Aldrich, Architects

A NEW and ever higher standard is being established for the architecture of educational structures of all kinds. Some of the most beautiful buildings in all America are those venerable halls in academic groves in Charlottesville, Cambridge, Princeton and elsewhere built by early American architects, and now after long decades of indifferent designing and careless planning American architects are rising anew to the situation and are designing educational buildings of every type which closely rival even the best work of a century ago, while in planning and equipment they establish a standard which is wholly new.

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from both theoretical and practical standpoints." In all cases easily understood explanations are furnished for the action of statically indeterminate structures. The relation between statically indeterminate and simple structures is given, and the causes for the difference in action are explained. Bending moment diagrams for rigid frames show in all cases the type of bending moments to which the various frames are subjected for different types of loading. When used intelligently, these alone may form a basis for approximate solutions of problems in cases where accuracy is not of prime importance. The chapter on building frames contains material and formulæ never before published. The treatment of arches is of great importance, and the explanations, formulæ and diagrams presented on this branch of the subject are original and of great value in understanding the action of an arch when subjected to loading or to changes of temperature. Of especial interest at the present time, in view of the great popularity of the parabolic arch as the basis of the design of large modern buildings, are the formulæ for this type of arch. The bending moments and thrusts at the critical sections for these arches may be taken directly from tables given.

From the point of view of the general architect, this book may seem rather involved and unnecessarily technical, when such problems can usually be referred to the structural engineer for solution. However, with architecture tending more and more toward the solving of its problems in accordance with simple engineering principles, a working knowledge of the underlying principles is very much to be desired, and to those who have to make the preliminary designs of structures involving concrete construction, the methods here described and the tables here presented for arriving at rapid approximations will be very valuable. Certainly if one wishes to have available information on the mechanics of concrete design it would be hard to find a more complete or standard work than is published in these four volumes.

CONCRETE, PLAIN AND REINFORCED. Volume II. Fourth Edition. By Frederick W. Taylor, Sanford E. Thompson and Edward Smulski. 688 pp. 6 x 9 ins. Price $7.50 Net. John Wiley & Sons, Inc., 440 Fourth Avenue, New York.

MEDITERRANEAN DOMESTIC ARCHITECTURE IN THE UNITED STATES

A REVIEW BY

WILLIAM P. SPRATLING

USING the phrase, "Mediterranean Domestic Architecture," Rexford Newcomb has gathered under that colorful title a more than interesting collection of illustrations showing distinguished present-day adaptations of Latin-Moorish architecture in America. Architects of almost any part of the country, though particularly those practicing in climates where such things are practical, will find this material sound, well selected and probably extremely valuable. Mr. Newcomb has already brilliantly distinguished himself in the profession as one of those few who are willing and able to take upon themselves the selective-critical duties of the true architectural educator. Of minds such as his there are all too few in the profession. His has been a work not only of explanation, but of true interpretation,—and stimulation. In the brief text he has tied his theme in well with tradition without being tiresomely specific historically. But at times one suspects Mr. Newcomb of painting an almost too alluring picture of his medium; or is it merely his literary phraseology? At that, he has said many things which will doubtless open the eyes of some of the more conservative members of the profession to certain possibilities of color and the like. He casually explains a certain electicism in the use of these "Mediterranean" styles by the variety of our climatic conditions in America, though neglecting to add that a comparatively unsophisticated America is likely to indulge in what may be termed nothing less than "stage stuff."

For one who likes to see the "stylistic sources" of these things inquired into more searchingly, Mr. Newcomb's remarks about derivations from what he calls the "Mexican Colonial" are perhaps inadequate. Speaking of Santa Fe and Mexico, he remarks: "This many-terraced type, fine examples of which are still to be seen in Taos, Laguna, San Ildefonso and other places, generally passes under the name 'pueblo,'—pueblo of course referring to a peopled place, or village, the generic Spanish term in Latin America"; and: "When the Spaniards employed these Indians to build structures with European plans and utilities, of the materials and upon the lines of the native work, there resulted a new type, half-Spanish, half-Indian, the like of which has nowhere else been developed." In this, of course, Mr. Newcomb is either entirely ignoring or merely neglecting to mention the vast accumulation of Spanish Colonial things in Mexico, where there are more than 15,000 early domed structures, most of which have received the definite impress of the hand of the native Mexican,—the Indian. However, he makes some acknowledgment in closing, saying that, " . . . by relying upon the early local expression in each community, and by the judicious selection of forms from the varied parent styles of Spain, Mexico, Italy or north Africa, the architect of our time may find a grammar sufficiently broad. . . . "

Mr. Newcomb's examples are well selected and run the whole gamut as to types. There are a few which are pretentious and frankly expensive; some of the simple utilitarian and intensely domestic types, and there are many, are not only very beautiful but also very distinguished. None of them are commonplace, and all show that ingenuity of design which gives evidence of the real fertility of imagination among the architects of America. And all of these examples, being related to the conditions out of which they have sprung, are certainly integral with the life of America today. The material for this book has not only been well selected, but fully illustrated. For each of the 70 examples shown there are probably an average number of six to eight illustrations from well taken photographs, and beautifully and consistently well drawn plot plans. As an example of bookmaking, Mr. Jansen has made a splendid thing of it. It is a volume which will make a distinguished addition to the shelves of an architect's library.

MEDITERRANEAN DOMESTIC ARCHITECTURE IN THE UNITED STATES, 223 pp. 10½ x 15½ ins. Price $15. J. H. Jansen, 315 Caxton Building, Cleveland.

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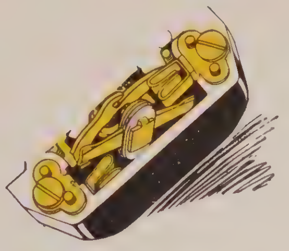

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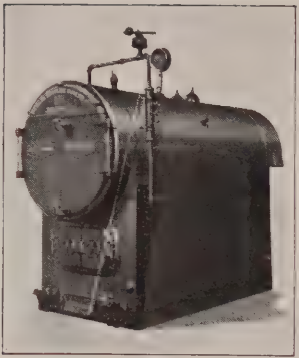

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THE
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VOLUME LI

OCTOBER 1929

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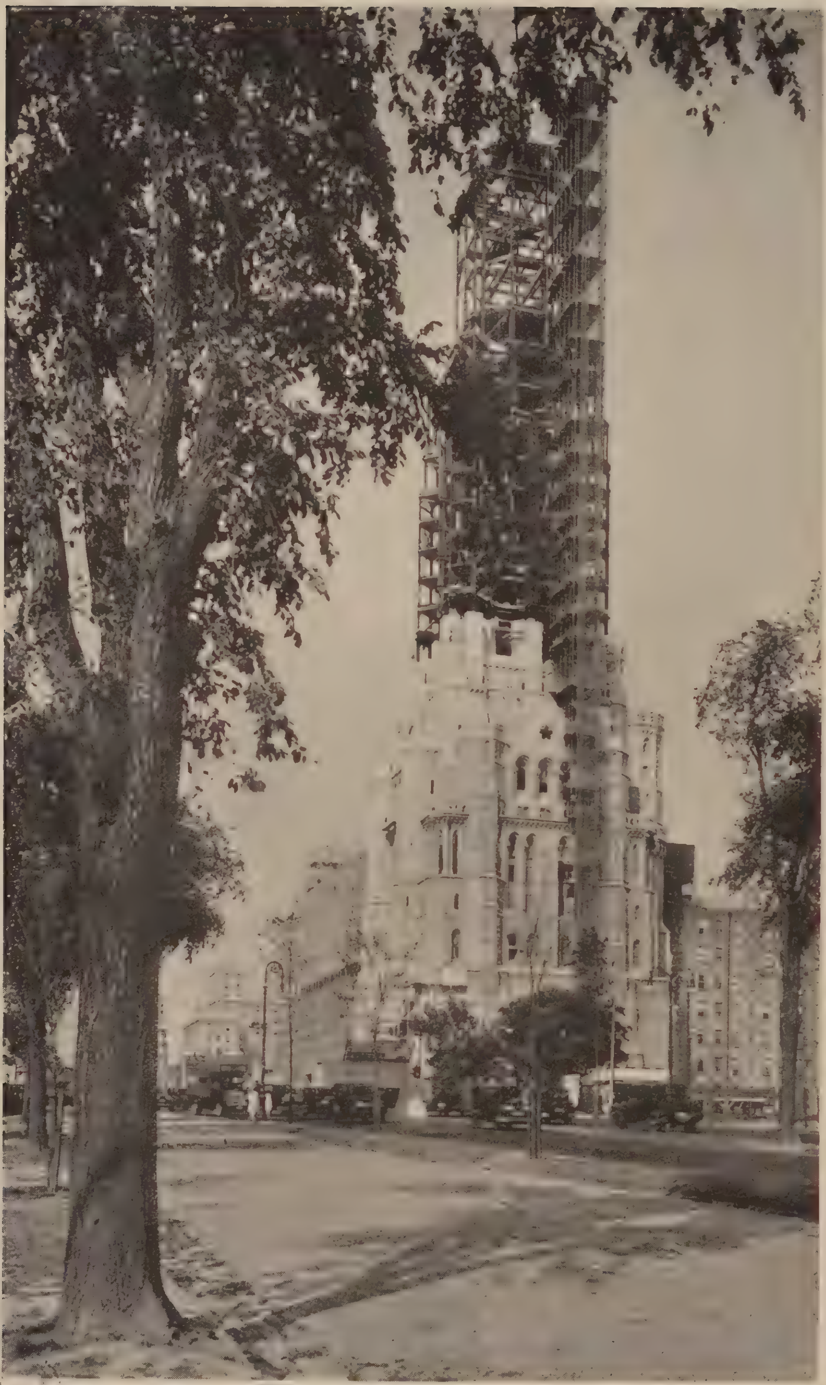

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STONE, STEEL AND SCAFFOLD

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From a Photograph by George H. Van Anda

THE
ARCHITECTURAL
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VOLUME LI NUMBER FOUR

OCTOBER 1929

COLD STORAGE WAREHOUSES

BY

CARL de MOLL

ARCHITECT AND ENGINEER, THE BALLINGER COMPANY

THE preservation of food has always been an important factor in the comfort, health, and existence of the race. In early times food was preserved either by burying it in the earth or by drying it in the sun. One of the steps in the progress of food preservation was the recognition of the fact that a low temperature would retard the progress of decay. A cellar or cave maintained a relatively low temperature throughout the year, being somewhat warmer than the outdoors in winter and much cooler in summer. Of course the smoking of meats was an early way of preserving them, and spices played an important part in food preservation. The search for short routes by water to the spice-producing countries of the East brought about many of the discoveries of the New World. Pickling is also one of the early forms of preservation, and alcohol still has its uses in this connection. All of the preservatives, however, change the nature or at least the taste of foods, and it remained for artificially produced conditions of cold and controlled relative humidity to keep foods for long periods without appreciable change from their fresh condition. The last 40 years have brought a tremendous development in the science of refrigeration and the storage of foodstuffs and other perishables.

Chemists and physicists had known for many years that it was possible to extract heat from almost any substance, but it was not until the latter part of the nineteenth century that machines were devised to do this on a relatively large scale. Fundamentally, a refrigerating machine is merely an appliance to extract heat from one place and put it into another. Any refrigerating machine must be equipped with water, air or some other substance to take the heat extracted by the machine away from the material or space to be cooled. Refrigerating machines were in early days used in breweries, and later in slaughter houses and meat packing houses. Probably their most rapid development began with the erection of great numbers of cold storage warehouses all over the country. With the increased use of cold storage warehouses there came the realization of the extreme importance of securing relative humidity as well as accurate temperature control. As the designing of a modern cold storage warehouse for the preservation of food products is a very complex problem, it is imperative that the best specialized engineering service be obtained. Only by the employment of experienced experts is it possible to obtain the best and most efficient building for the least expenditure of money.

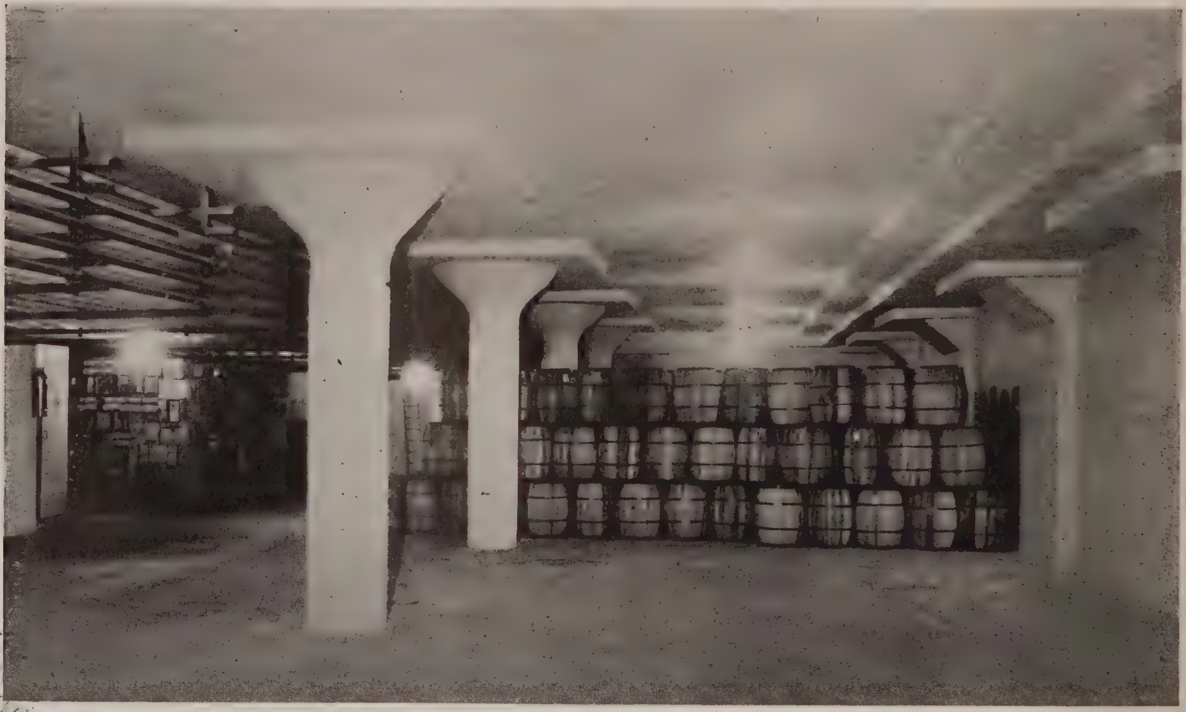
In general, cold storage warehouses can be roughly divided into two general classes,—one, buildings designed for the preservation of a particular substance at one temperature; the other, buildings which must be capable of taking care of a large variety of substances, each at a different temperature. In the first class are buildings for the storage of citrus fruits, apples, or meats. It is important, in the storage of fruit, to recognize the fact that the general tendency of a cold storage warehouse is to reduce the relative humidity of the air. This is deleterious to the product, as it extracts a large amount of water from the fruit, thus drying it and reducing its size and quality. It is, therefore, imperative that a properly high relative humidity be maintained at all times. This is complicated by the great danger of there being fungus growths and mould, which will always appear if the humidity is too high. This has led to the adoption of elaborate systems of ventilation, and it has also led to the introduction of use of chlorine fumes for the prevention of mould.

Where a building is for the general storage of a great variety of foods, it is necessary to divide it into a number of separate rooms. There are many foods, including meat and fish, that it is frequently desirable to receive and place in rooms with a temperature at or below zero, known as

Quaker City Cold Storage Warehouse, Philadelphia
The Ballinger Company, Architects and Engineers

"sharp freezing rooms," where the material is frozen, then transferred to a room slightly below the freezing point where it can be carried in a frozen condition almost indefinitely. This of course leads to serious complications in insulation, as goods piled close to the wall next to a sharp freezing room are likely to freeze unless there is proper air circulation in the room. A room over a freezing room must have the material stored on high dunnage and air circulation maintained across the floor. The building must, of course, be designed with the various coils under separate control, so that the temperature of the room may be changed to suit the various seasonable commodities as they are stored at various times during the year. Over a period of years, through scientific research, there have been established ideal temperatures and relative humidities for practically all the food products which are usually carried in cold storage warehouses.

Important factors in the design of a warehouse are the arrangements for receiving, distribution, checking and delivery of goods. Most warehouses of any size are, of course, equipped with railroad sidings, most of the goods coming in by railroad in carload quantities, and after the period of storage distributed to trucks or wagons from an adequate shipping platform. This necessitates very careful checking, so that not only the packages belonging to various owners, but various brands can be so segregated that they can be taken out of storage as the demand warrants. It is found that certain manufacturers are packing the same or similar goods with a number of different brands or labels. These must, of course, be segregated, so that they are obtainable with a minimum amount of handling. There are some houses where the goods are received by trucks or wagons, and after a period of storage, are shipped by railroad. This is more often true in houses built for a single commodity, which is received from the growers at the ripening time and carried in storage and shipped by carloads as the demand warrants. The design of the mechanical equip-



Interior of Quaker City Cold Storage Warehouse Showing Construction
The Ballinger Company, Architects and Engineers

GREAT LAKES TERMINAL WAREHOUSE
GENERAL MERCHANDISE AND COLD STORAGE

Great Lakes Terminal Warehouse, Toledo
William H. Adams, Architect

ment of a storage house is very important, due to the large expenditure of power which is involved. Slight losses become extremely serious in additional cost. The availability of a large supply of water is imperative, and if it is possible to obtain this water from deep wells, giving a low temperature water at all times in the year, great economy can be obtained. It is also usually advisable to use outside current wherever possible, as, there being no use for the heat, the public service current is usually cheaper than that of an individual power plant. Many cold storage houses have, as an auxiliary business, the manufacture of ice, in some cases installing large rooms for ice storage, so that a relatively small plant working every day in the year can store ice during the colder weather to be available at the time of greatest demand. The owner can thus supply a very large demand at certain seasons with a relatively small expenditure for ice-making equipment.

The building should be of fireproof construction, with adequate insulation, the best material being compressed cork slabs, 4, 6 or 8 inches in thickness. In general, there are two systems of insulation; one known as the "envelope" system, in which the entire storage area is enclosed in a continuous envelope of cork,—that is, a multiple-story building of 10 or 12 floors would have the first floor used for receiving and shipping; the second floor would have a thick cork insulation. The roof and four walls would also be insulated. The intervening floors would simply be of concrete or steel construction. This system is usually recommended only for a large building and for storing one kind of goods, where the same temperature is carried through the entire house, since it would be impossible to carry different temperatures on the various floors without insulation between. It also has the disadvantage of being extremely difficult to avoid there being settlement cracks in the insulation, especially in the upper part. In some buildings which have been built under this system, it is necessary to have periodical inspections made of the insulation, carefully calking any cracks which develop. Where rooms of different temperatures are needed in the building, it is much more advantageous to segregate each of

Interior of Great Lakes Terminal Warehouse, Toledo, Showing Construction and Equipment
William H. Adams, Architect

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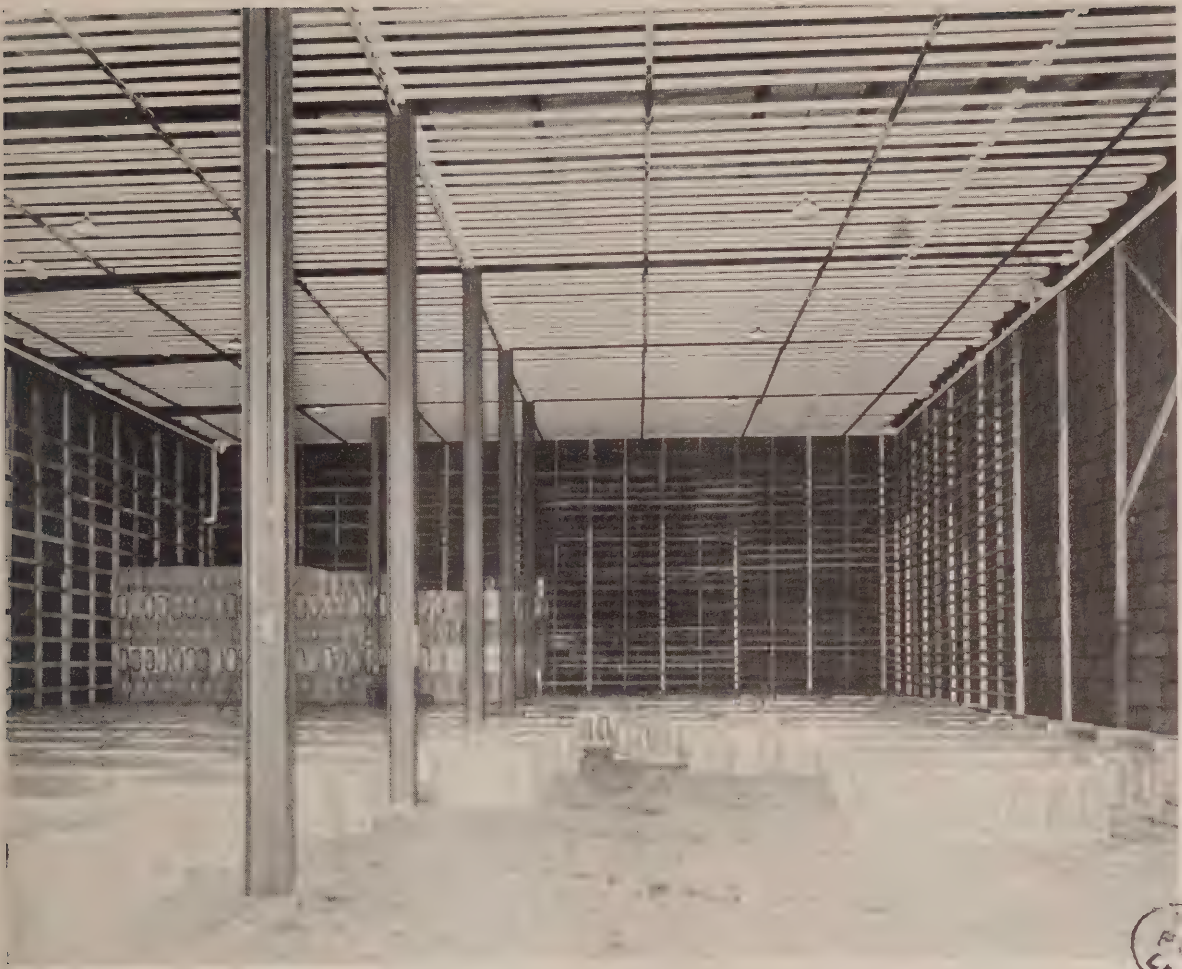
Effective Design of the Bekins Van & Storage Co., San Francisco
F. Eugene Barton, Architect

these rooms with heavy insulation, sometimes placing insulation on every floor. The building for the Quaker City Cold Storage Company in Philadelphia, illustrated here, is designed to contain rooms of all temperatures from below freezing to rooms held slightly above freezing, for the storage of vegetables, candy, etc. The apple storage warehouse for the Arrington Cold Storage Company at Arrington, Va., is designed for the storage of apples in barrels, solely. An interesting feature of this building is that only the alternate floors are solid. The intervening floors are of slat construction, so that the bunker containing the refrigerating pipes and ventilating system is available for two stories of storage.

The question of insurance is important, due to the fact that this cost must be added to the storage charges, so that any saving is directly reflected in profits. It is, therefore, imperative that every effort be made in the design of the building to obtain the minimum rate both on building and contents. There should be the proper division of areas by fire walls, segregation with fire doors, automatic sprinklers, fire hydrants and hose reels through the building, adequate water supply and pumping equipment. The sprinkler equipment will necessarily be of the dry pipe type, and special precautions should be exercised so that there shall be no condensation to freeze in the pipes or around the heads. The electric lighting equipment must be entirely open wiring, as it has been shown that an installation of conduits is impracticable, due to accumulation of moisture in the pipes. The elevators should be of a large size, and of high speed, with an automatic leveling system. The size of elevators should be adapted to the size and number of trucks which it is decided to use, selecting a standard truck which will hold the largest amount it is possible for one man to handle. It is also desirable to consider the use of platforms for lift trucks. In a tall building, the elevator should run at as high a speed as it is possible to obtain. As there is a great deal of leakage of cold air down the elevator shafts when the doors are open, most houses are equipped with vestibules on each floor. It is much better, however, to in-



Interior of Ice Storage Plant of Borin Brothers, Detroit, Showing Insulation and Temperature Maintaining System

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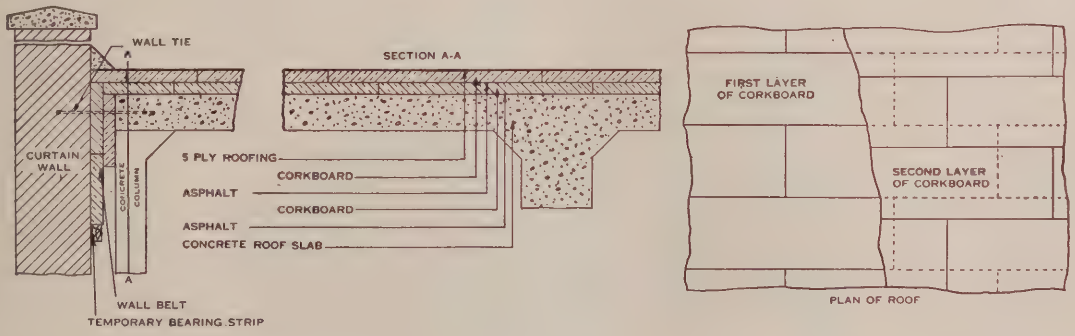
sulate the floor, roof and three sides of the elevator car with heavy cork, installing a rubbing strip around the door and installing weather strips of heavy soft rubber bearing on these rubbing strips, so that when the elevator car is level with the floor, the door can be opened and no air can escape down the shaft around the door opening. It is also desirable to use heavy insulation around the door frame to avoid condensation at the sill, there being a great deal of trouble due to condensation forming around the sill and freezing where rooms are closed for a long period of time.



Section and Plan Showing Method of Insulating a Cold Storage Building

Quaker City Cold Storage Co., Philadelphia
The Ballinger Company, Architects and Engineers

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Merchants' Refrigerating Co., New York
G. B. Snook & Sons, Architects

The matter of handling goods by conveyors is still a debatable point among cold storage building operators. Some things, such as sides of beef and material of similar character, are now handled on overhead tracks. There have been some houses where belt and live roll conveyors can be used. There are also some installations of vertical conveyors, for both loading and unloading the room. Where wages are high, it is economical to use the largest amount of conveying machinery possible. As this equipment is relatively expensive, however, it requires a very careful analysis of the entire problem, as it is never economical to use expensive machinery unless it can be kept moving a large part of the time. There are many and varied interests to be satisfied in an intricate building of this kind. The heads of the shipping and receiving departments, the storage departments, the accounting department and the general manager frequently have very different ideas as to the proper design and layout of the building. It is usually the major problem of the designing engineer to analyze the opinions of the various executives, giving due weight to the ideas of the men who have to do the work, but being careful not to sacrifice the efficiency of the complete unit for slight additional gains of a single department. Whether or not the proper solution of these various factors is obtained frequently makes the difference between a good and economical, or very bad and inefficient design in the completed building, and a pleased or a displeased client.

Arrington Cold Storage Co.
Arrington, Va.
The Ballinger Company, Architects and Engineers

INFILTRATION AND THE HEATING PROBLEM

BY

P. E. FANSLER

INFILTRATION and exfiltration combine to make a formidable problem for the architect; that is, if he has consideration for the comfort and for the pocketbook of his client. Consider a house of ordinary construction, an outdoor temperature of zero, and a high north wind. Air at zero temperature infiltrates through the north side of the house, is heated, and exfiltrates through the southern walls, windows and doors. Until recently very little reliable information has been available as to the demand on the heating plant due to infiltration. Indeed, it is hard to believe the actual facts, now that they are known, because they seem to be out of all reason.

About two years ago the research committee of the American Society of Heating and Ventilating Engineers determined to solve the infiltration riddle and replace, with the results of actual tests, figures that were little more than guesses. The Bell Telephone Company of Missouri had erected a new and high building in St. Louis and offered the use of one of its upper floors to the Society. The elaborate equipment developed in the research laboratory of the Society was set up in St. Louis so that actual infiltration could be determined. One reason for accepting this offer was that steel windows of the latest type had been used, and infiltration data on them were of great value because of the increasing use of this type of window. The testing apparatus installed consisted of a large rectangular metal box, open on one side with a device fixed at the center of the opposite side so that orifices of desired diameters could be used. The box was fastened to a wall area containing the window to be tested, and the periphery carefully calked so that the contact was airtight. An arrangement of a very delicate pressure gauge permitted the taking of readings that determined the flow of air through the orifices, so that air infiltered through the window cracks passed through the orifices and was quantitatively determined.

One of the interesting stories of practical research is that of these investigators who waited, day after day, for wind of desired velocities and directions, so that practical determinations could be made. But the wind blew from every direction but that desired. Finally, exasperated, they exercised typical ingenuity by fitting a casing to the window, with a pipe to which a blower was attached. Thus it was possible artificially to simulate wind pressure of any desired velocity, regardless of the caprices of nature. Valuable data were obtained, showing the extent to which these metal windows could be expected to limit infiltration. From the knowledge we have on this subject, it is evident that a building may require more heat when the thermometer is well above zero and with a high-velocity wind blowing than for a condition where the temperature is below zero and the air at rest. For this reason the average wind velocities of the three months of greatest heating load,—December, January and February,—must be taken into consideration when determining heating requirements. Not only velocity, but direction, is a factor in figuring infiltration as well as heat loss. Obviously, it is impossible to set up test equipment that will exactly simulate natural conditions of "wind and weather." A controllable pressure that is equivalent to a known wind velocity *at right angles to the plane of the window* can be provided, but windage *against* a window is seldom uniform and fixed in direction.

In order to picture the situation and to show how the architect can control it to the lasting benefit of his client, let us consider a living room, as shown in Fig. 5, extending across one end of a house. Essential data are given on the sketch. From values actually determined by tests made in the research laboratory of the American Society of Heating and Ventilating Engineers, let us build up a tabulation for various wind velocities, showing: (a) the infiltration through the uncalked crack around the frame *of the north windows only;* (b) the radiation required to heat this inflowing air to 70°; (c) the infiltration through the crack around the sash, including the meeting rail crack; (d) the radiation necessary to heat this volume of air; (e) the total infiltration on account of these windows; (f) the total radiation necessary because of *infiltration* around this group of windows and its frame. Bear in mind that we are not considering the loss of heat through the window glass. The results, Table I, are startling.

With an assumed wind velocity of 5 miles an hour,—a wind condition hardly noticeable,—there will blow into this room, through the north windows alone, in one hour, almost enough air, at zero temperature, to entirely fill the room. At least 15 square feet of radiation will be necessary to heat this air to 70°. With a 10-mile wind the infiltration will be 6,535 cubic feet, and 35 square feet of radiation will be needed. Increasing the wind velocity to 20 miles an hour brings the infiltration to almost four times the volume of the

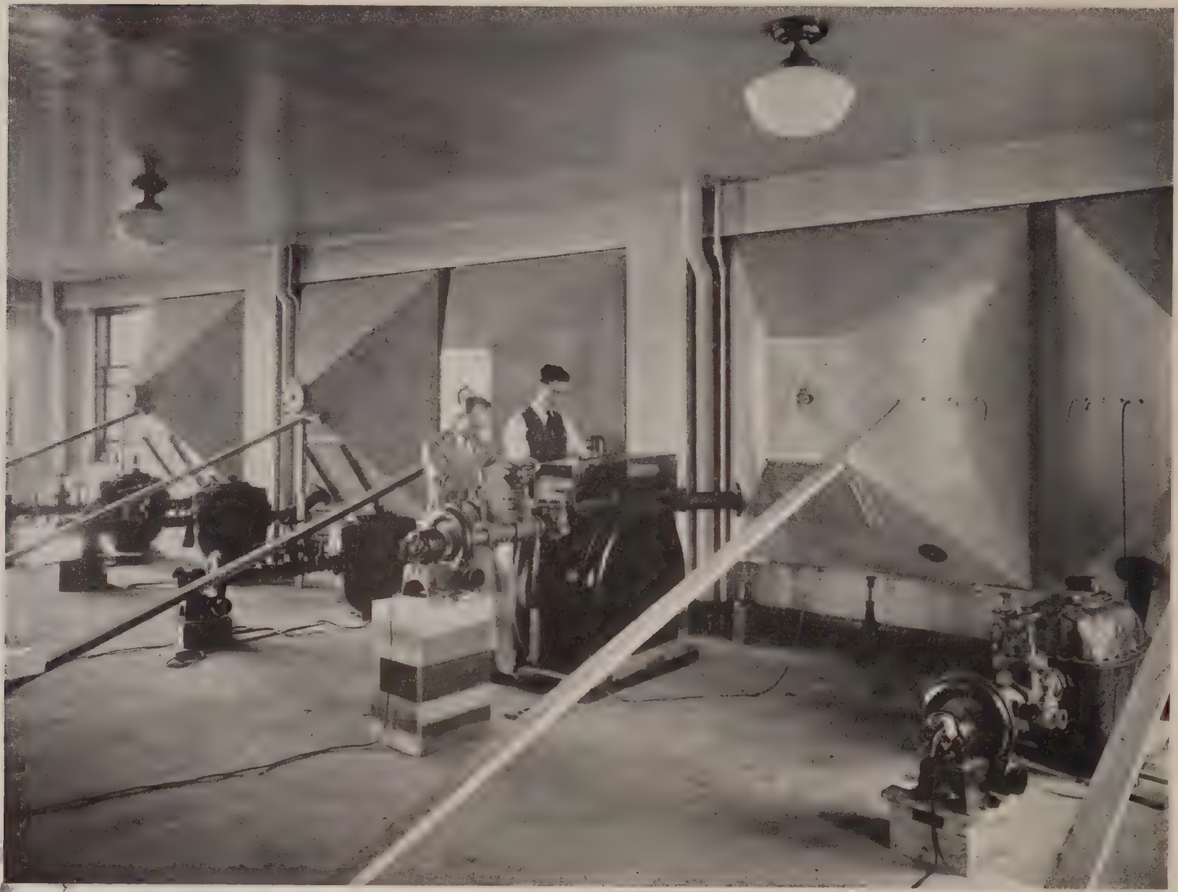

Fig. 1. Measuring Infiltration in a Field Laboratory Established in an Office Building

room, and the radiation to 61 square feet, and if we consider a 30-mile wind,—no stranger during the bitter cold of December and January,—the leakage through this window will change the air in the living room every *11 minutes.* Under this condition heat must flow continuously from a huge radiator,—100 square feet,—to heat the incoming air, and coal must be burned at the rate of 3 pounds per hour, or nearly 75 pounds per day, just because of this "leaky" window. To show what can be saved by carefully installed stripping, another portion of the table has been computed. It is evident that the reduction in radiation requirement,—100 square feet with no weatherstripping and a 30-mile wind, reduced to 33.8 square feet,—is so material as to warrant serious attention to the problem. This example admittedly is extreme, as a 30-mile wind is considerably in excess of normal winter winds, but such a wind is not uncommon, and should be taken into consideration.

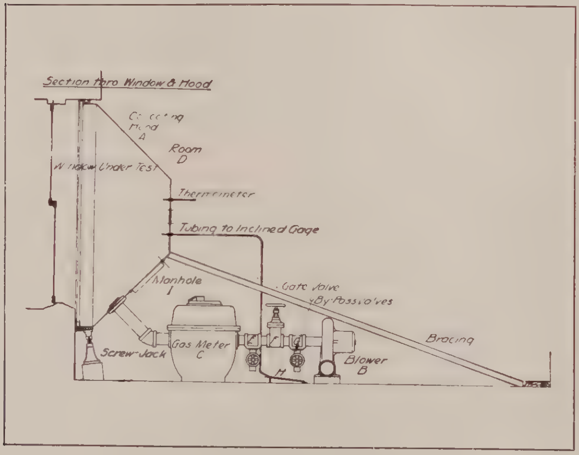

Fig. 2. Diagram Showing the Arrangement of Apparatus Used in the Office Building Tests

It must be remembered that one part of this so-called loss is entirely unnecessary where attention is paid to details in construction. Practically all leakage around window frames can be stopped by proper calking. This is true whether wood or metal windows are considered. Taking the case of the room and windows under discussion, we have found a radiation requirement of 100 square feet for the four windows, with a 30-mile wind. Of this, 10.4 square feet represents frame leakage, and all of this 10 per cent of the whole can be prevented if the frame is well calked. By proper weatherstripping, the

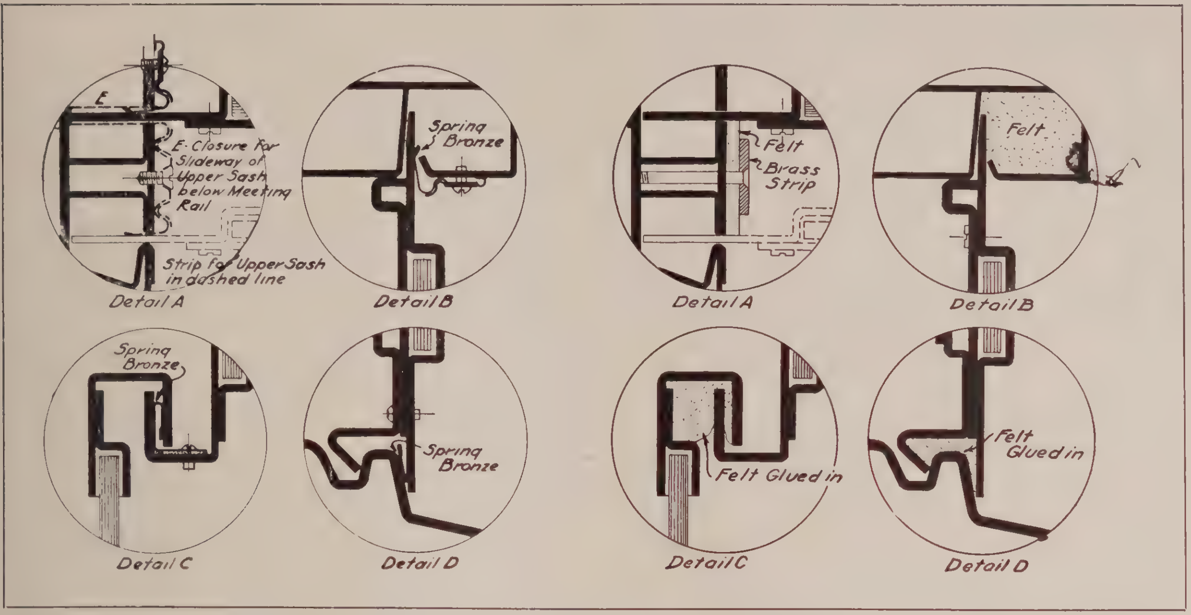

Fig. 3. Design and Construction Details of Two Commercial Types of Weatherstripping Applied to Metal Windows Under Test

radiation, as we have seen, can be reduced to 33.8 square feet,—a gross saving of 76 per cent. Surely economies of this order demand, in every case, attention and analysis by the architect.

Essential data developed through the tests at St. Louis[1] are presented here in tabular form in Table 2. The values have been reduced by 20 per cent from the figures shown by the tests because, while they are derived from actual tests, they do not represent ordinary conditions, where pressure is built up in rooms, reducing the infiltration rate by about one fifth. Of course, all the air that blows into the windward side of a house exits from the leeward openings and cracks, frequently accelerated by suction created as the result of the wind. Consequently, when arriving at the total demand, only one half of the radiation due to infiltration loss (as computed for all exposed walls of a building) need be added to the radiation required to offset the direct heat loss.

In studying infiltration losses, research engineers have differentiated between "crack" and "clearance." The drawing, Fig. 6, will make this clear. The crack is taken as one half the difference between the width of the frame and the width of the sash. The clearance is the difference between the width of the stile and the thickness of the sash. One of the interesting findings, in reseach[2], is the fact that increasing the crack around the perimeter of a plain sash did not materially increase the leakage, and that weatherstripped sash, while permitting much less leakage, showed a small increase in leakage with increase in crack. Tests on a plain wood window, with various clearances, brought out the curious fact that the size of the crack around the perimeter has no appreciable effect on the leakage. Consequently the data developed can be applied to any window of the type tested with a crack of from 1/16 of an inch to ¼ of an inch. It has not been found practical to install wooden windows with cracks of less than 1/16 of an inch, and as the windows age and dry, the cracks increase in width. A typical set of test curves for a plain double-hung

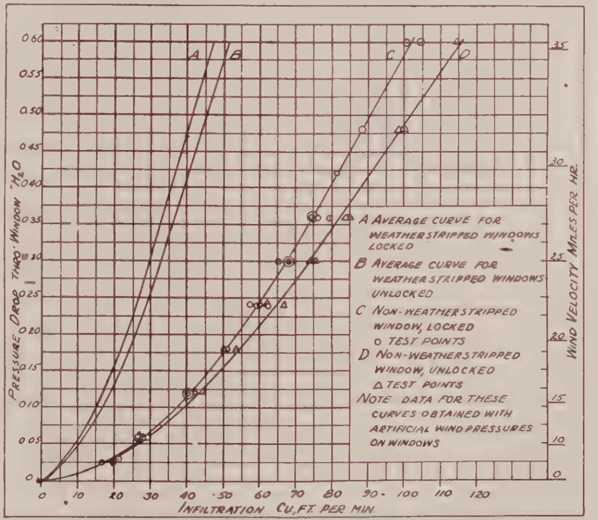

Fig. 4. Graph of Infiltration Through Metal Windows, Locked and Unlocked, With and Without Weatherstripping

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[1] Note 1.—"Saving Heat in Skyscrapers," a paper read at the 1928 annual meeting of the A. S. H. & V. E. by F. C. Houghten and M. E. O'Connell.

[2] Note 2.—"Effect of Frame Calking and Storm Windows on Infiltration Around and Through Windows," a paper presented at the 1928 semi-annual meeting of the A. S. H. & V. E., by W. M. Richtmann and C. Braatz.

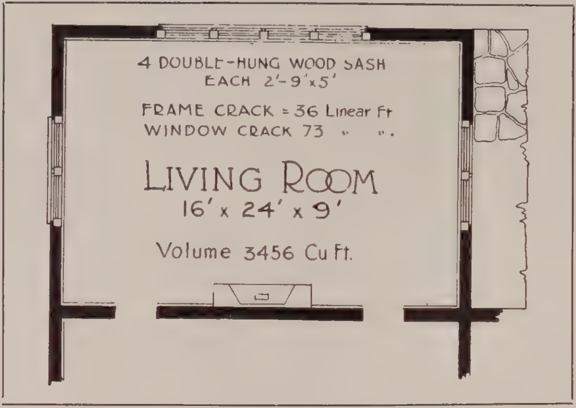

Fig. 5. Plan of Living Room with Four North Windows, for which Infiltration Losses are Computed (Table 1), to Show the Importance of Reducing Infiltration to a Minimum

wood window is shown in Fig. 7, from which is evident the tremendous increase in leakage with increase in sizes of crack and clearance.

Referring to Table 3, we can readily determine the economies of weatherstripping. For New York and vicinity the average wind velocity during the three months of December, January and February is 13.3 miles. The nearest to this figure, in Table 3, is 15 miles. At this velocity the table shows that 0.65 square feet of radiation is required to take care of the loss due to infiltration through 1 linear foot of crack. If the window were weatherstripped, the corresponding radiation requirement would be 0.12 square feet, showing a saving of 0.63 square feet of radiation. A fair estimate of cost for a heating system would be $2 per square foot of installed radiation, and the saving effected through weatherstripping can safely be taken as one half of this, or $1. As the weatherstrip probably could be put on for less than 50 cents a foot, there is no question as to the economy. Turning to the question of annual saving, we get another angle of the problem. If we assume 5,300 degree-days heating load, we will find a requirement of about 70 pounds of coal per square foot of radiation, per heating season. At $16 per ton, the annual saving, due to weatherstripping, would be about 30 cents, or almost enough to pay for it. With the data here given, and by applying the method of fuel determination described in the article on "Determining Fuel Requirements by the Degree-Day Method" in the February, 1929 issue of THE ARCHITECTURAL FORUM, the archi-

TABLE 1.—CALCULATIONS OF INFILTRATION AND CONSEQUENT RADIATION REQUIREMENTS OF WINDOWS SHOWN IN FIG. 5

Wind Velocity	CRACK AROUND FRAME				WINDOW CRACKS (No Weatherstripping)			
	Factors per Ft. Uncalked Crack Around Frame		Total for Frame for 4 D. H. Windows Having 36 Lin. Ft. Frame Crack		Factors per Ft. Crack Around Sash*		Total for 4 D.H. Windows With 73 Lin. Ft. Crack	
Miles per Hour	Leakage, Cu. Ft. Per Hr.	Sq. Ft. Radiation Required	Leakage, Cu. Ft. Per Hr.	Sq. Ft. Radiation Required	Leakage, Cu. Ft. Per Hr.	Sq. Ft. Radiation Required	Leakage, Cu. Ft. Per Hr.	Sq. Ft. Radiation Required
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
5	1.41	0.007	48	0.3	39.3	0.21	2860	15.2
10	11.3	0.06	405	2.16	84.9	0.45	6180	32.8
20	31.1	0.16	1110	6.1	161.0	0.85	11750	55.2
30	53.6	0.28	1925	10.4	233.0	1.23	16950	89.6

Wind Velocity	WINDOW CRACKS (Weatherstripped Window) Quantities same as (6), (7), (8) and (9)				Total for Frame and Window Infiltration		Total for Infiltration, Frame and Weatherstripped Window	
Miles per Hour	Leakage, Cu.Ft. Per Hr.	Sq. Ft. Radiation Required	Leakage, Cu. Ft. Per Hr.	Sq. Ft. Radiation Required	Leakage, Cu. Ft. Per Hr.	Sq. Ft. Radiation Required	Leakage, Cu. Ft. Per Hr.	Sq. Ft. Radiation Required
	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
5	3.00	0.016	219	1.2	2908	15.3	267	1.5
10	11.7	0.062	854	4.5	6585	35.0	1259	6.7
20	34.9	0.19	2540	13.8	12860	61.3	3650	19.9
30	59.6	0.32	4340	23.4	18875	100.0	6265	33.8

*Including meeting rail. Allowing for 1/16-inch crack and 7/64-inch clearance.

tect can determine the saving effected for his client by calking window frames, providing for tight windows, and by having weatherstripping installed.

Attention should be directed to the fact that the best types of weatherstripping carelessly applied may fall far short of providing the immunity from infiltration claimed in the printed matter of the manufacturer. The technique of application is of as great importance as the excellence of design or quality of manufacture. Again, some defect quite apart from the weatherstripping may defeat its purpose. A certain living room, for example, had two French doors in the west wall. The leakage was so great that it was impossible to maintain a 65° temperature when a wind was blowing from the north or west. When a real "norther" was blowing, a candle flame was frequently blown out at a distance of 3 feet from the crack between the door edges. Metal weatherstripping was applied, and, as the house was rented, the owner tried to economize by awarding the contract on a price basis. When the next "norther" came, it was found that the infiltration had materially been reduced, but that the candle flame was in danger 1 foot from the tops of the doors! Investigation proved that the doors were warped to such an extent that tight weatherstripping was impossible. It all goes to show the dependent character of the various component parts of a building, and that it does not pay to skimp in any particular.

In many parts of the country storm sash are in common use, and it is interesting to read the conclusions drawn by W. M. Richtmann and C. Braatz, of the faculty of the University of Wisconsin on an exhaustive study of frame calking and storm window application[2]. They say that: "The infiltration through the crack between a brick wall and window frame is a very important factor in calculating the infiltration into a room. However, this source of leakage can be practically eliminated by the application of some type of calking compound to the crack. The application of storm sash does not materially decrease the infiltration of a tight-fitting window, but it does give a large saving if the crack and clearance of the window are large. The application of a wool strip between the frame and storm sash reduced the infiltration appreciably. The storm sash applied by means of four turn-buttons reduced infiltration much more than those applied by means of a hook-and-eye suspension arrangement. The infiltration through the crack between a brick wall and window frame for a plastered wall is about 40 per cent of that through the same crack on a plain wall. This leakage may be as great as the leakage through the sash perimeter of the window."

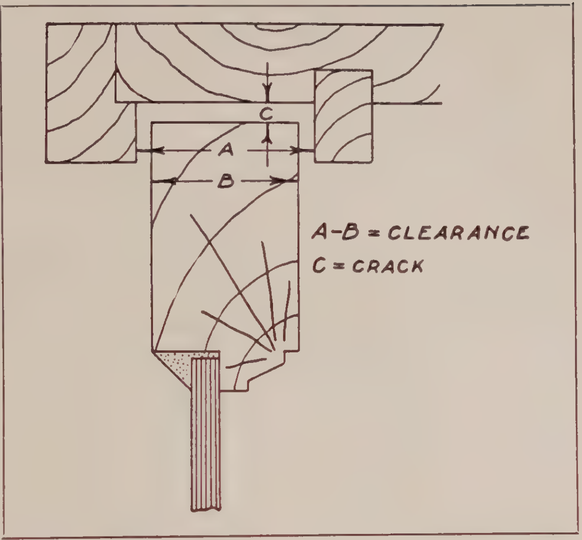

Fig. 6. Sketch Showing the Distinction Between "Crack" and "Clearance"

Turning, now, to the modern steel window, much used in industrial buildings and residences, we find some valuable data resulting from a series of tests made at the University of Michigan by Professor J. E. Emswiler and W. C.

TABLE 2—INFILTRATION THROUGH DOUBLE-HUNG METAL SASH WINDOWS PER FOOT OF CRACK

	Wind Velocity Miles per Hour	Non-Weatherstripped Window, Locked			Non-Weatherstripped Window, Unlocked			Weatherstripped Window, Unlocked		
		Leakage, Cu. Ft. per Hr.	Heat Loss B.t.u. per Hr. 0–70° Fahr.	Sq. Ft. Radiation	Leakage, Cu. Ft. per Hr.	Heat Loss B.t.u. per Hr. 0–70° Fahr.	Sq. Ft. Radiation	Leakage, Cu. Ft. per Hr.	Heat Loss B.t.u. per Hr. 0–70° Fahr.	Sq. Ft. Radiation
Values for practical use; average test values reduced by 20 per cent to allow for building up of pressure in room, etc.	5.0	20.4	25.7	0.10	20.4	25.7	0.10	6.5	8.2	0.03
	10.0	45.4	57.2	0.24	47.3	59.6	0.25	18.6	23.4	0.10
	15.0	70.4	88.6	0.37	74.0	93.1	0.39	31.5	39.7	0.17
	20.0	96.3	121.2	0.51	103.8	130.7	0.55	46.0	57.9	0.24
	25.0	125.0	157.6	0.66	137.1	172.8	0.72	60.2	75.8	0.32
	30.0	153.8	193.4	0.81	170.4	215.0	0.90	76.0	95.6	0.40
	35.0	186.8	236.0	0.98	212.0	267.5	1.11	94.5	119.0	0.50

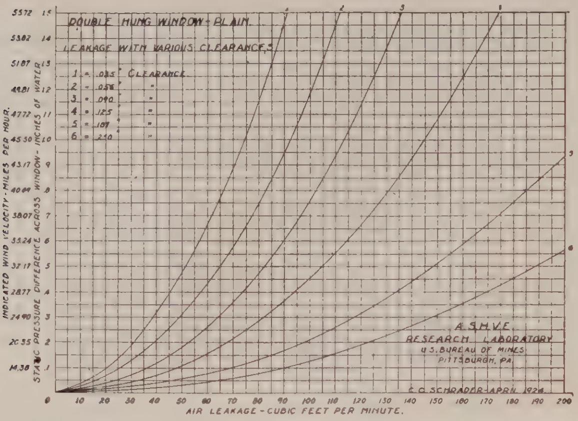

Fig. 7. Graph Showing Leakage Through Plain Wood Window with Various Clearances

Randall[3]. In addition to carrying out a study of leakage through the cracks of rolled steel windows, a field study was made to determine the crack widths found in practice. Measurements of more than 1,600 steel windows are tabulated in Table 4, from which it will be seen that much less air can pass through the cracks of steel windows than through corresponding openings around conventional unweatherstripped wood sash. The tests indicated that when steel windows are calked with mastic, as is the common practice with residential casements, heavy section casements, heavy casement-section projected, and possibly architectural projected, or grouted with cement, as is the common practice with industrial pivoted windows, the frame leakage is negligible.

In figuring wood windows, the frame and the other leakage are to be added to the crack leakage to obtain the total. In the steel window there will be little or none of the frame leakage often found in wood windows, because the steel framing is usually installed in the opening with grout or mastic, and the co-efficient of expansion of steel is so near that of building construction that the bond is maintained intact. Cracks at mullions and at contacts where the windows are attached to the steel framework are found to give negligible leakage if care is exercised in installation.

Professor Emswiler brings out an interesting and important point in connection with high buildings. He says: "Even without any wind, a difference of temperature inside and outside will cause the pressure state inside to be less than that outside at the ground, and greater near the roof, and inflow will occur at lower windows and outflow at upper windows. If the building is tall and open throughout from bottom to top, or if arranged in stories in free communication from one to another, and if the temperature difference is great, the pressure difference created at a point near the ground and also at a point near the roof may be considerable. Thus in a building 200 feet high with 70° Fahr. difference in temperature, this force alone, causing inflow at the ground and outflow at the top, may easily exceed 0.2 inches of water, which is the equivalent of a 20-mile wind. If the building is multiple-storied, and if there is absolutely no communication between stories, then the force of temperature difference is effectually nullified, or rather reduced

TABLE 3—INFILTRATION THROUGH DOUBLE HUNG WOOD SASH WINDOWS

	Wind Velocity Miles per Hour	Per Foot of Uncalked Crack Around Frame*			Per Foot of Crack around the Sash including Meeting Rail for Cracks of 1/16-in. and 7/64-in. Clearance, Window Unlocked					
					Plain Non-stripped Wood Window			Aver. Weatherstripped Window		
		Leakage, Cu. Ft. per Hr.	Heat Loss B.t.u. per Hr. 0–70° Fahr.	Sq. Ft. Radiation	Leakage, Cu. Ft. per Hr.	Heat Loss B.t.u. per Hr. 0–70° Fahr.	Sq. Ft. Radiation	Leakage, Cu. Ft. per Hr.	Heat Loss B.t.u. per Hr. 0–70° Fahr.	Sq. Ft. Radiation
Values for practical use; average test values reduced by 20 per cent to allow for building up of pressure in room, etc.	5.0	1.41	1.77	0.007	39.3	49.5	0.21	3.00	3.80	0.016
	7.5	6.36	8.08	0.034	62.8	79.2	0.33	6.82	8.60	0.036
	10.0	11.3	14.3	0.060	84.9	107.0	0.45	11.7	14.9	0.062
	15.0	22.6	28.7	0.12	124.0	157.0	0.65	22.9	29.1	0.12
	20.0	31.1	39.4	0.16	161.0	203.0	0.85	34.9	44.3	0.19
	30.0	53.6	68.2	0.28	233.0	294.0	1.23	59.6	75.6	0.32
	40.0	76.0	96.5	0.40	309.0	390.0	1.63	87.8	111.0	0.46
	50.0	88.9	114.0	0.48	390.0	492.0	2.05	117.0	148.0	0.62

Notes.—A. This table is approximately correct for cracks up to ¼-in.

B. The values given for the plain non-stripped wood window and for the weatherstripped window include the "elsewhere" leakage through the frame, but not the leakage through the uncalked crack around the frame. If the frame is to be left uncalked, the loss under that heading should be included in the heat loss calculations.

*Practically all leakage around frames can be stopped by proper calking.

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[3] Note 3.—"The Weathertightness of Rolled Section Steel Windows," presented at the 1928 meeting of the A. S. H. & V. E.

to an amount proportional to the height of a single story. However, there is always some communication by means of stairs and otherwise, so that the force of temperature difference is always operative in some degree."

It is worth comment that the quantity of infiltration is dependent upon things other than wind velocities and cracks. It is obvious that the outer air cannot be forced through the cracks of a building on the pressure or windward side unless the same volume of air passes out through the leeward side. Therefore the interior layout of the building and the character of its occupancy must enter into the problem. If a room on the side of excessive winter exposure is seldom used, and if the communicating doors are generally kept shut, the infiltration will be slight regardless of the weather-tightness of its walls and windows. For this reason, it might be in order to weatherstrip interior doors as a means of decreasing infiltration. By the same token, open transoms tend to increase infiltration, as do chimneys from fireplaces and kitchen vents, especially if supplemented by electric fans. An interesting example came up in connection with a large house where the kitchen was vented with draft produced by an electric fan. The ventilation was entirely adequate, but it was not realized that the infiltration, some 400 cubic feet an hour, required the use of more than 1,000 gallons of oil per heating season.

An interesting point came to light recently when calculations were made of heat losses and infiltration for a house located near New York. Three rooms, forming one long and one short adjoining wall, were considered (Fig. 8). The radiation requirements were computed for the condition where the long wall faced north and the short wall, east. The house then was assumed to be rotated clockwise, so that the long wall faced northeast and the short wall, southeast, and the amount of radiation was determined. This process was repeated, with 45° steps throughout the circle. It was found that the requirements varied 50 per cent.

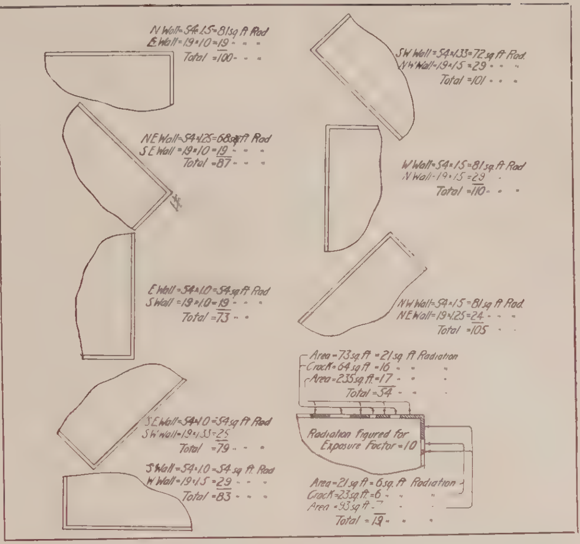


Fig. 8. Diagram Showing Variation in Radiation Required for Various Exposures

There is a growing tendency on the part of the builders to install insulation, weatherstripping, and the other elements that may add to the first cost of a house but which reduce the annual cost of operation, and which frequently provide for more comfortable occupancy. As has been suggested, these refinements may bring about savings in other elements that completely offset their cost. It is entirely possible, in the construction of a small house, to spend $500 for insulation and weatherstripping and save $300 or $400 in the cost of the heating plant. At the same time, a more comfortable house is insured for summer occupancy, and a more salable property is produced.

TABLE 4—MEASURED CRACK WIDTHS OF STEEL WINDOWS IN SERVICE

Building Designated by Letter	Type of Window	Number of Ventilators Having Crack Width Indicated Which Represent the Average of a Number of Trials at Edges of Ventilators							
		0.006″	1/64″	1/32″	1/16″	⅛″	¼″	Total No.	Aver. Crack
A (U. of M.)	Heavy section casement	7	28	25	4	4	..	68	1/32″ –
B (Detroit)	Residential casement	56	39	6	1	..	..	102	1/64″ –
C (U. of M.)	Heavy casement section projected	..	8	12	9	7	..	36	3/64″ +
D (U. of M.)	Heavy casement section projected	58	214	6	10	2	..	290	1/64″
E (U. of M.)	Heavy casement section projected	77	127	10	..	..	..	214	1/64″ –
F (U. of M.)	Industrial pivoted	..	7	19	30	35	6	97	3/32″ –
G (Detroit)	Industrial pivoted	16	45	46	27	11	15	160	1/16″ –
C (U. of M.)	Commercial projected	..	..	..	..	128	103	231	3/16″
H (U. of M.)	Commercial projected	..	80	24	6	..	..	110	1/64″ +
I (U. of M.)	Architectural projected	43	41	5	21	..	..	110	1/64″ +
J (U. of M.)	Architectural projected	6	53	13	10	6	..	78	1/32″ –
K (U. of M.)	Architectural projected	76	90	13	..	..	..	180	1/64″ –

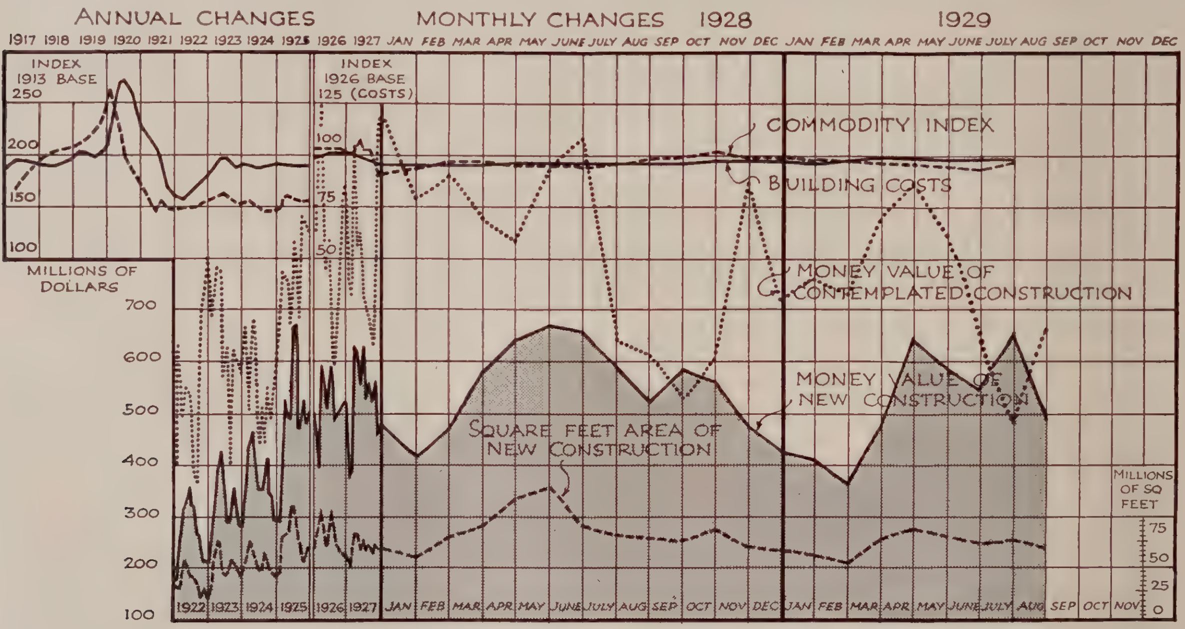
THE BUILDING SITUATION

A MONTHLY REVIEW OF COSTS AND CONDITIONS

IN view of the fact that contracts awarded for construction during the month of July represented the second highest monthly total recorded to date, it is not surprising that August construction shows a decided falling off in several of the areas of the United States. The August contract total for the 37 states east of the Rocky Mountains amounted to $488,882,400, according to the F. W. Dodge Corporation, a decline of 25 per cent from the July total and a decline of 5 per cent when compared with that of August of last year. This brings the total of the first eight months of this year up to $4,156,865,300, a decrease of 9 per cent from the corresponding figures of 1928. In the district comprising New York state and northern New Jersey, value of August contracts amounting to $94,506,000 was 57 per cent below the July figures and 26 per cent below those of August, 1928. For the first eight months of the year this district showed total contracts awarded amounting to $1,001,911,700, a decrease of 16 per cent.

Construction work started in the New England states totaled $33,459,900 during August, a figure 21 per cent below that of the preceding month and 14 per cent below that of August, 1928. The construction total in this district for the first eight months of this year amounted to $283,950,100, which is 12 per cent below the first eight months of 1928. In the middle Atlantic states construction fell off 39 per cent as compared with July. The August total was $45,595,600. This also represents a decrease of 11 per cent from that of August a year ago. For the eight months of this year the total of $508,393,700 was 5 per cent below that of 1928.

The central western and northwestern states showed a comparatively small decline in August. In the central west, with contracts awarded amounting to $153,170,800, the decrease was 4 per cent from the July figures and 8 per cent from the August, 1928 total. For the eight-month period this district showed new construction started to the amount of $1,225,572,900, a decrease of 11 per cent from that of the first eight months of last year. The total of $8,303,100 for August construction in the northwestern states was 6 per cent below the preceding month and 20 per cent below August of last year. However, construction for the first eight months of 1929, with a total of $65,734,500, was 21 per cent ahead of the corresponding period of 1928.



THESE various important factors of change in the building situation are recorded in the chart given here: (1) *Building Costs.* This includes the cost of labor and materials; the index point is a composite of all available reports in basic materials and labor costs under national averages. (2) *Commodity Index.* Index figure determined by the United States Department of Labor. (3) *Money Value of Contemplated Construction.* Values of building for which plans have been filed based on reports of the United States Chamber of Commerce, F. W. Dodge Corp. and *Engineering News-Record.* (4) *Money Value of New Construction.* Total valuation of all contracts actually let. The dollar scale is at the left of the chart in millions. (5) *Square Foot Area of New Construction.* The measured volume of new buildings. The square foot measure is at the right of the chart. The variation of distances between the value and volume lines represents a square foot cost which is determined, first by the trend of building costs, and second, by the quality of construction.

ELECTRICAL WIRING LAYOUTS FOR OFFICE BUILDINGS

BY

NELSON C. ROSS

ELECTRICAL ENGINEERS, RICHARD D. KIMBALL CO.

THE electrical wiring layout for an office building will be necessarily influenced by the size and location of the building, the type of construction, and the completeness of the equipment desired, and also upon whether the building is to be occupied wholly by the owner or is to be wholly or partially for rental.

In general, the wiring layout will include separate wiring systems for the control of lighting and power services; conduit raceways for the development of the telephone and miscellaneous low tension office equipment; protective wiring, including fire alarm and watchman's clocks, together with the required distributing switchboards, panelboards, wire closets, motor, equipment, and lighting fixtures, etc.; and the final connection with the service mains.

Construction. With the smaller office buildings of second class construction, and where it is unlikely that the walls and partitions will be changed to meet the requirements of new tenants, the use of B X armored wire is permissible where the circuits occur in wood construction. With the use of B X armored wires, however, standard 4-inch conduit outlet boxes should be used on all branch circuits for all outlets. These boxes are fitted with the regular fixture receptacle and switch covers, the armored wires entering the boxes with approved clamp type box connecters and lock nuts. With the use of B X, construction "troubles" will nearly always occur at the "outlets" and are mainly due to the use of too small outlets or ceiling plates, the improper insulation of splices, and the crowding of the wires and splices in the outlet boxes.

Expense permitting, however, rigid conduits should always be used for both high- and low-tension wiring and for all types of building construction, since, with the use of rigid conduit properly installed, there is ample room for the installation of wires without crowding, and the wires may be withdrawn, replaced, or added to, at will without the necessity of cutting walls or construction.

With all buildings of first class construction, or where wires must be installed under cement floors, in masonry, or in damp locations, the use of rigid conduits for all services is obligatory.

Preliminary Information. Upon the commencement of the work, a rough approximation should be made of the connected load for both lighting and power services, and such information, together with the rough plot plan, should be given to the public service company, in order that the company may determine the character of the service available for both lighting and power, and also determine the point at which the service cables will enter the building. A copy of the local installation rules of the public service company should also be obtained, as well as any local ordinances governing the installation of the work, and such rules together with the requirement of the "code" should be also ascertained and this information given the telephone company and like service companies, in order that the point of entrance may be determined and the low tension service conduits proportioned for the maximum requirements of the building.

Circuit Wiring. In planning the circuit wiring throughout the office floors, provision should be made for a meter closet on each of the floors. This closet should be located at some central point, and be accessible from the public stair hall or corridor. Panelboards of the lighting system and connecting cabinets of the low tension systems, as well as the terminal cabinets of the public telephone and A.D.T. services, should be installed in these meter closets, and all circuits of all services on the floor should be run back to the meter closet and connect with the respective cabinets, etc.

To facilitate the installation of risers and feeders, meter closets should, as far as possible, be located one over another on the different floors and connected with a vertical wire shaft. The required demensions of the meter closet will depend upon the number of offices served from the closets. With the smaller buildings with some 15 or 25 offices on a floor, a closet floor space of approximately 6 x 8 feet or more may be required. With the larger buildings, the closet space should be increased in proportion.

Where, with large floor areas and the use of one meter closet, branch circuits exceed 125 feet in length, two or more meter closets should be considered for each floor, these closets being so spaced that the average length of the branch circuits will not exceed 100 feet. With the use of more than one meter closet on a floor, each closet should be made to serve a definite zone, and all branch circuits of all services within the zone should be run back to, and connected with the respective meter closets. Where a building is to be occupied wholly by one tenant, less space may be required in the meter closets, as individual office meters will not be required.

In planning the circuit wiring throughout the offices and rented spaces, provision must not only be made for fixed ceiling outlets, and outlets in permanent walls and columns, etc., but a flexible arrangement of conduit outlets, and switches, etc. must be had, these being interconnected to permit of the ready extension of circuits, and the metering of one or any number of offices from a single meter as desired.

In general, the outer building walls, corridor bearing walls, columns, and stair enclosures, being fixed, may be equipped with sub-panels, outlets, switches, etc. Conduits and outlets, however, should, in general, be kept clear of partition walls, permitting the removal and relocation of the partitions without interference with electric conduits and outlets.

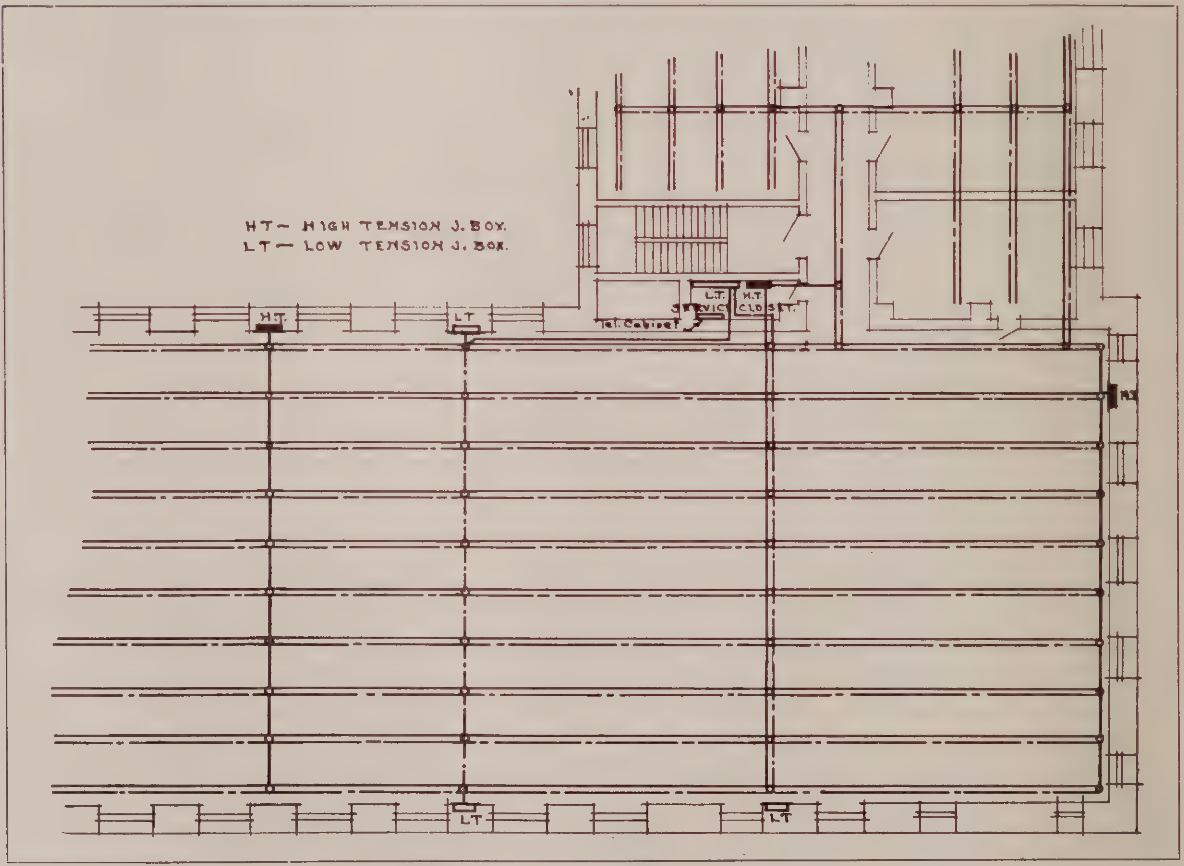
The spacing of outlets for ceiling fixtures throughout the offices will be influenced by the height of the ceilings and the location of the exposed beams. In offices with floor areas of approximately 12 x 20 feet, two ceiling outlets will give satisfactory results. Where the office width exceeds 12 feet, it is advisable to use four outlets. In larger areas, spacing of ceiling outlets should not exceed the hanging height of lighting unit.

It is difficult to determine the required lighting intensity for different offices, as this will be influenced by the class of work carried on and the individual desires of the tenants. The code rules call for a definite number of watts per square foot of floor area, but this value will be far exceeded in practice. It is well to provide additional room in the conduits, as well as extra circuits on the panelboards to permit of the extension of additional branch circuits if they are required.

In practice, no office circuit should be fully loaded, and it is seldom that more than two or three ceiling outlets are connected on a circuit from the panelboard. Outlets for the use of wall fans should be wired on separate circuits from the lighting, and convenience outlets should be also wired on separate circuits with not more than two convenience outlets connected to the branch.

In general, an office of approximately 12x24 feet of floor area will require two ceiling outlets connected on one branch circuit, and under local switch control; four convenience receptacles, properly spaced and wired on two circuits, permitting the later extension of additional circuits from the outlets for possible special equipment; and two receptacle outlets on walls or columns, 7 feet, 6 inches above the floor (wired on one circuit) to provide for wall fans.

Where it may be determined that certain office spaces may be rented for barber shops, hair dress-



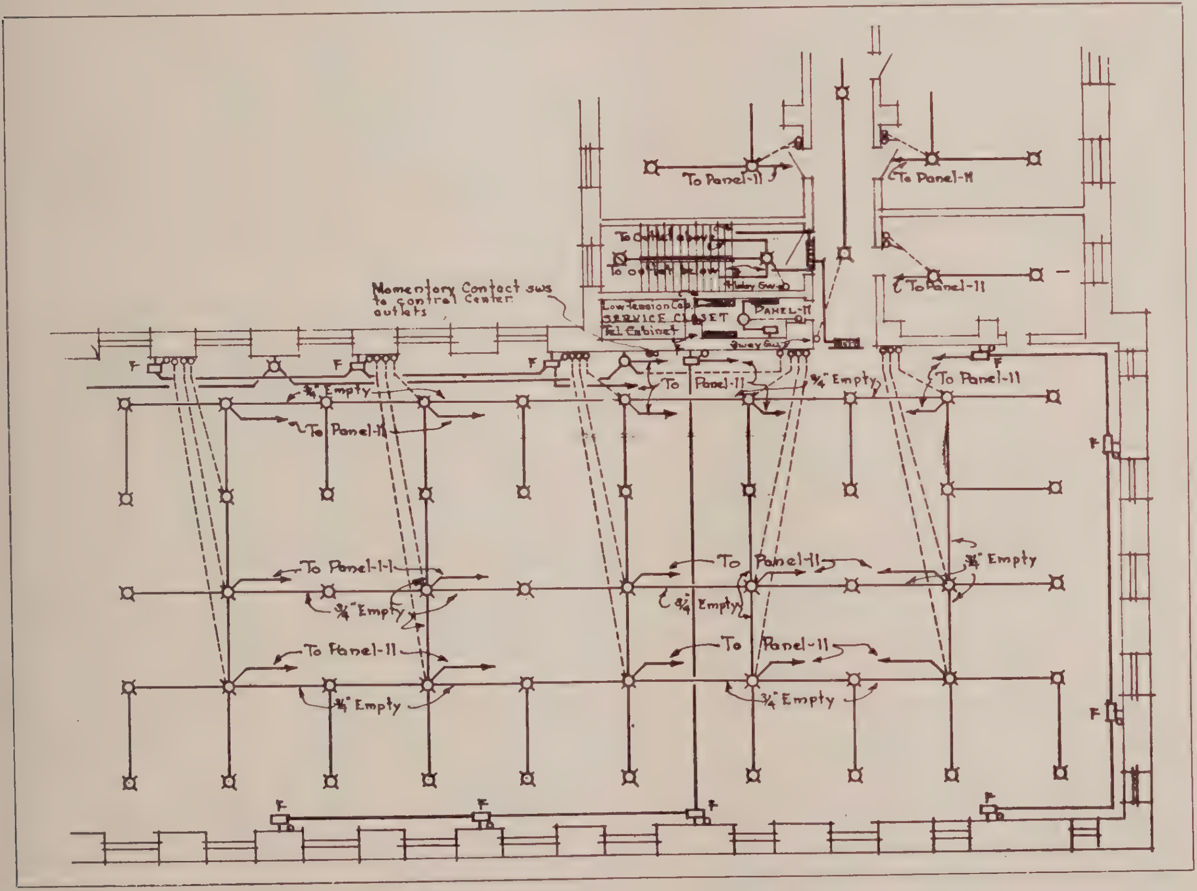
Typical Under-floor Duct System Giving Full Coverage in Large Office Space ing parlors, or beauty parlors, and where high wattage equipment may be required, it is good practice to provide an empty conduit (of not less than 1¼ inches) from the panel cabinet in the meter closet to each such office space to provide for possible future loads, the conduit to be capped at a point near ceiling convenient for future extension.

For the development of the lighting circuits throughout larger areas, one method of circuit wiring employs the use of one ceiling outlet in the center of each bay, this outlet fed from two full circuits from the panelboards in the meter closet. With the development of the "space," circuits are extended from the center outlets using a metal moulding to additional ceiling outlets, switches, and convenience receptacles, as may be required. These center outlets may be further cross-connected using empty ¾-inch conduits forming a conduit network in the ceiling construction through which future circuits may be developed.

A second method employs the use of uniformly spaced outlets throughout each of the bays, at approximately from 8- to 10-foot spacings, (usually four outlets to the bay) and each two outlets fed from a circuit from the meter closet; switch legs are dropped from the outlets to switches on columns or on permanent walls. Receptacle outlets are also provided on columns and permanent walls, setting them 18 inches above the floor for general office use and 7 feet, 6 inches above the floor where used for wall fans. Where an underfloor duct system is not used, the conduits feeding the receptacle outlets should be run in the floor slab. Added flexibility may be secured by the use of junction boxes, one in each bay section, these being set in columns at a point near the ceiling, the feeding conduit passing from the meter closet through the junction boxes to the outlets, the junction boxes in turn being connected together with empty conduits, thus permitting the interconnection of the office circuits.

Public Circuits. Public circuits will include all wiring throughout corridors, stair halls, general toilets, elevator lobbies, outside lighting, public rooms, etc. These circuits should be run back to the meter closets on the respective floors and connected to the public service panelboards in the meter closets, these panelboards controlling from the public feeders, and metering from the building meters on the distributing switchboard.

Corridor lighting outlets may be spaced to conform to the ceiling design, and with flat ceilings



Typical Lighting System in a Large Office Space

Lighting Fixtures Properly Spaced to Illuminate a Large Open Office Area

will be spaced approximately 20 feet apart. Corridor lighting may be controlled from local switches in the corridors, in group from the meter closets, or from remote control switches in the office of the superintendent, or by means of time switches as desired. With the use of remote control or time switches, however, the corridor and stair lighting should be double-circuited, with the main illumination under the master control, and with the second or emergency circuit controlling part of the illumination from local three-way switches on the stairs and in the corridors. The emergency lighting under the three-way switch control will also act as "watchman's lights," permitting the watchman to "light up ahead" as he makes his rounds. Red lamp receptacles, or illuminated exit signs may be located at all their entrances and also at the exits from the building, these being wired to control from the emergency corridor circuits.

Where illuminated direction signs may be required, flush receptacles may be set at the required height and fed from the public circuits under the control of local switches.

With the use of floodlights or large electric signs, branch circuits may be carried back to the nearest meter closet, connected to feed from a separate panelboard in the meter closet and controlled from separate risers and remote control switches on the switchboard with push-button stations in the office of the superintendent.

Provision must be made for the lighting of the elevator cars from outlets in the hoistways to which the flexible lighting cables of the cars may connect with separate circuits feeding these outlets from the nearest meter closet. Two separate circuits should also be run from the nearest meter closet to each pent house or elevator machine room to provide current for floor-indicating equipment.

Stores. Where the building includes stores, all wiring for them must be independent of the building wiring, each store being wired as a unit under separate service switch and meter control. Where possible, a service room accessible from a public corridor should be provided for the service switches and meters, the whole being fed from separate feeders from the distributing switchboard and from the street side of the building meters. This applies to both power and lighting services. Each store must have an approved service switch with meter loop, the service feeder running from the service switch to the panelboard in each of the stores.

Panelboards may be in the basement with the store lighting controlled from local switches, or they may be in the stores and all circuits controlled from switches on the panelboard. Stores will include ceiling outlets over counters usually spaced on not more than 10-foot centers, floor and fan receptacles, show window and entrance lighting, and provision for electric signs.

Circuits for window and sign lighting may pass from the panelboard to a junction box at or above the transom, the circuits developing from the junction box (in the window construction) to the outlets. Show window reflectors may be of the flush recessed type or of the surface type. They are as a rule set approximately on 12-inch centers and are wired on two or more circuits, with the circuits controlling alternate reflectors. Outlets should be designed for not less than 150-watt lamps. Each window should also be provided with two base receptacles on independent circuits. In view of the store's possibly requiring power service, or service for the use of electric heating devices of high wattage, it is good practice to make the main lighting feeder for the stores "oversize" and to provide also a power feeder from the distributing switchboard to the meter group, in turn carrying an empty conduit from the meter group to the basement of each of the stores, terminating the conduits in pipe caps in readiness for later extension. Provision for public telephones may be made throughout the stores, using conduits and wire mouldings.

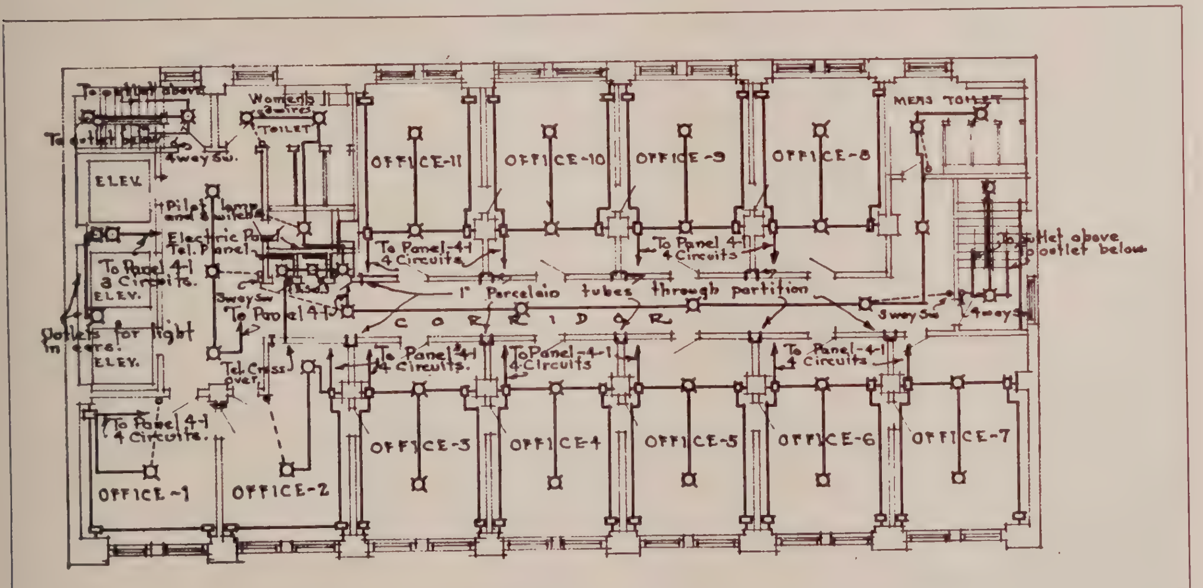
Assembly Hall. An assembly hall will require the lighting of the platform, by means of possibly one or more stage border reflectors, a footlight reflector, and a series of floor outlets and receptacles on the platform, and also flush receptacles at the front of the platform for the lighting of the music of an orchestra. Lighting of the hall will be from properly spaced ceiling outlets and from brackets on the side walls. The whole is controlled from a panelboard on the platform, and from a separate feeder from the switchboard.

Provision must be made for illuminated exit signs at all exits, as well as for emergency lighting for the aisles, etc., these circuits being fed from a separate panelboard in the lobby or convenient to the entrance of the hall. This panel should be controlled from a separate emergency feeder from the switchboard.

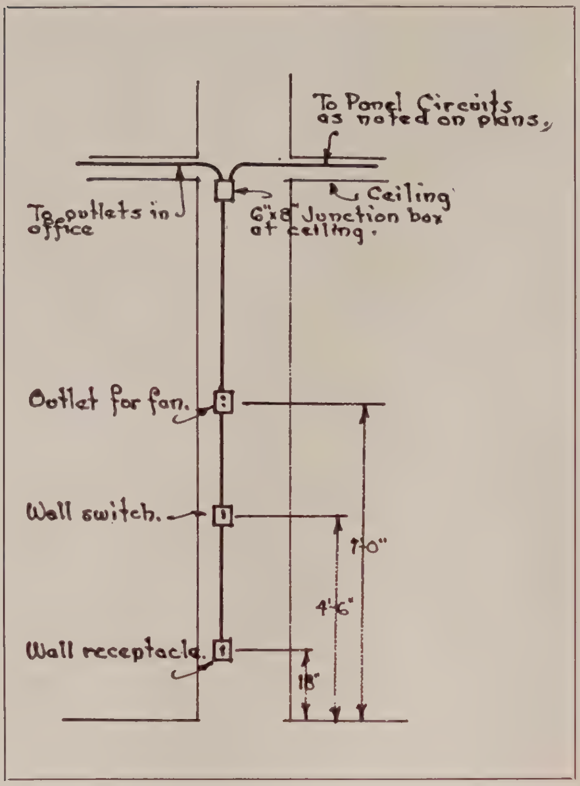
With the use of a projection booth, the lighting of the booth and adjacent rooms may be controlled from the lobby panelboard. A separate circuit, however, should be carried from the switchboard to the booth for the operation of the projector machines and lanterns, this equipment under the control of a separate panel in the booth. Provision should also be made for the control of the ceiling illumination of the hall from a remote control switch on the platform panelboard, with push-button control stations in the booth, and also for a return call bell system between the booth and the platform.

Cafeteria. A cafeteria will require lighting service, power service for the operation of kitchen motors, as well as electric heating circuits for the control of electric ranges, warming ovens, and miscellaneous electric cooking equipment. The lighting of the cafeteria may be under local switch control or controlled from a special cabinet in the cafeteria. Separate power and heating feeders should be run to the cafeteria from the switchboard, each terminating in a cutout panel in the kitchen, with tap circuits run to the respective kitchen motors and heating outlets. Power and heating feeders for the cafeteria should each be separately metered from the switchboard.

Wires and Cables. All considered, the successful operation of the wiring system is dependent upon the "insulation" of the system as a whole, and this applies not only to the insulation of joints and splices in outlets and junctions, panel and switchboards, etc., but also to the



Typical Wiring Layout for Small Office Building Divided into Small Offices



Typical Column Layout for an Office Building, Showing Dimensions

"grade of insulation on the wires." In the writer's experience, the cost of *high grade insulation* for all wires carrying secondary lighting or power voltage and for "code insulation" has been offset by the lower maintenance cost in operation.

It is further suggested that all wires and cables for use on primary circuits (2,300 volts and above) be insulated for not less than double the working voltage of the circuits on which they are to be used. Conduits and wires should not be installed in close proximity to steam pipes, or where subjected to high temperatures. Where it becomes necessary to run wires in trenches or elsewhere with steam piping, varnished cloth-insulated wires should be used rather than those of rubber. Cables insulated with varnished cloth may be generally used for feeder cables and mains; they are allowed a greater current-carrying capacity than rubber-insulated cables, and as a rule are cheaper to install.

Where feeder circuits are run under floors of sub-basements or in outside trenches and are subjected to moisture, the wires and cables must be sheathed with lead in addition to the insulation. Where the length of the branch circuits exceeds 80 feet, it is advisable to use nothing smaller than No. 12 wire.

Where vertical feeders or riser circuits are run to the panelboards in the wire closets and in elevator hoistways, etc., provision must be made for supporting the weights of the cables in a way other than from the terminal lugs of the panels and switches. The required clamping methods may be obtained from the code.

All wires used throughout the low tension system for the operation of clocks, bells and like equipment should be of No. 14 gauge as used for the lighting circuits, and should be installed with the same care as the wires of the lighting service. In view of the development of the circuits throughout an office building to meet the requirements of new tenants, as well as the tendency toward the use of high wattage equipment, the mains and feeders should be proportioned for not less than the full connected load of the building.

Outlet Boxes and Fittings. The exact types of the outlet boxes to be used for any installation must necessarily be dependent upon the building conditions at the outlets. In general, however, nothing less than the standard 4-inch galvanized conduit boxes should be considered for both fixture, switch and receptacle outlets. This also applies to both conduit and B X construction in second class buildings. Outlet boxes for use with low tension wiring should, in general, be of the same type as used with the lighting circuits, except where special boxes of cases are required for special equipment.

Local Switches and Receptacles. In general, flush switches will be used for the control of local circuits. The use of the tumbler or push-button switch is a matter of choice, either giving satisfactory service. Switch plates may be of brass, bakelite, or of composition, and either may be had in any standard finish. Where the circuit load is heavy, the use of a double-pole switch "connected single-pole," (with the two blades in multiple) will provide double capacity and reduce switch maintenance cost. It is good practice to set local switches not less than 58 inches above the floor in order that the switches will not interfere with the installation of a chair rail.

Local switches controlling the lighting in vaults may be set in the outside of the vault wall and adjacent to the entering door, such switches being made up in combination with a receptable, (for use with a portable lamp for the vault,) and with a pilot lamp that will glow when the vault lighting is in use.

Lighting outlets in closets may be controlled from switch combinations with pilot lamps, or door switches may be installed in the door jambs. Similar pilot lamps are of convenience in circuits controlling local electric heating equipment, these being wired to indicate when the circuit is in use, and also for use with small motors in ducts or remote from the point of the control.

Three-way and four-way switch combinations will be of convenience for control of corridor and stair lighting. Remote control switches may be used when it is required to control a circuit or motor from a distant point, the switch being located at the load with control wires running to and terminating in momentary-contact push-button stations, with a pilot lamp to indicate when the switch is closed. Approved safety switches must be used at all motors to master the circuit, these in addition to remote control switches if they are used.

Convenience receptacles, as a rule, should connect on circuits separate from the lighting outlets. Receptacles may be had in 10-, 20-, 30-, 50-, and 100-ampere capacity and in two- or three-pole type. Single circuits must be run to all receptacles of more than 10-ampere capacity, and also to 10-ampere receptacles where the anticipated load exceeds 300 watts. The carrying capacity of the wires connecting to high capacity receptables should be not less than the ampere capacity of the receptacle.

Lighting Fixtures. The type and design of the lighting fixtures for the building is largely a matter of choice. Lighting fixtures of special design will probably be required in the entrance lobby, for post standards, outside brackets, vestibules, and for special offices, etc., and they may be of the multiple arm, ceiling collar or pendant type, designed for direct, semi-indirect, or wholly indirect illumination.

The standard type of lighting fixture, in general use for office illumination, consists of a pendant or ceiling collar, (depending upon the height of the ceiling,) employing a single lamp of the required wattage, with a partial or wholly enclosing globe. Pendant fixtures may be of the rigid pendant type, the chain hanger type, or the "single link" type, which permits the pendant to always "hang plumb." In general, for good results, the lamp should hang from 8 feet, 6 inches to 10 feet above the floor. In corridors, toilets, etc., and where the ceiling height does not exceed 8 or 9 feet, some type of ceiling collar must be considered. In the design of the wiring layout ,the type of lighting fixture need be considered only in a general way, as with proper spacings and with ample wattage at the outlets, any desired type of lighting fixture may be used.

Power Circuits and Equipment. All motor circuits (other than for motors of fractional horse power) should be designed to operate from the separate power feeders from the power section of the distributing switchboard. These circuits are independent of the lighting service, even though the characteristics of the power and lighting services (as with a single-phase, or direct-current) are the same. Power and lighting services should be metered separately, to take advantage of the power rate usually offered by the companies.

Office Lighting Showing Development of Circuits from Central Outlets by Using Metal Moulding Conduit

Motors of fractional horse powers for desk fans and portable office equipment, etc., are standardized to operate at the lighting voltage of from 110 to 125 volts, and as a rule feed from receptacles and from the lighting circuits. Motors of fractional horse power for kitchen equipment, including dishwashers, polishers, grinders, food choppers, and refrigerator boxes, are standardized to operate at the lighting voltage for both direct or single-phase A.C. current, and as such motors are rarely of more than 1 horse power, they may connect from the lighting feeders or may operate from the power service and at the power voltage, with the motors balanced on the phases. The use of the standard single-phase motors on such equipment is to be preferred, as these motors are carried in stock, and can quickly be replaced in the event of breakdown.

All motor circuits should be run in conduits, terminating in fused safety switches at the motors, the circuit leading from the switches to the motor terminals. Direct current motors will require a controller or starting box connected between the switch and the motor. Alternating current motors of not exceeding 7½ horse power will not require controllers. Motors of more than 7½ horse power will require controllers or starters. This applies to both the constant and variable speed types. Where motors are stopped and started under remote control, or other than from

B & S GAGE	CAPACITY OF WIRES				CONDUIT SIZES FOR								
	AREA IN CIRCULAR MILS.	RUBBER INSULATION AMPERES	VARNISHED CAMBRIC AMPERES	OTHER INSULATION AMPERES	1	2	3	4	5	6	7	8	9
					SIZE OF CONDUIT IN INCHES								
18	1624	3		5									
16	2583	3		10									
14	4107	15	18	20	½	½	½	½	½	¾	¾	1	1
12	6530	20	20	25	½	½	½	¾	¾	1	1	1	1¼
10	10380	25	30	30	½	¾	¾	¾	1	1	1¼	1¼	1¼
8	16510	35	40	50	½	¾"	¾	1	1	1¼	1¼	1¼	1¼
6	26250	50	60	70	½	1	1¼	1¼	1½	1½	2	2	2
5	33100	55	65	80	¾	1¼	1¼	1¼	1½	2	2	2	2
4	41740	70	85	90	¾	1¼	1¼	1½	2	2	2	2	2½
3	52630	80	95	100	¾	1¼	1¼	1½	2	2	2	2½	2½
2	66370	90	110	125	¾	1¼	1½	1½	2	2	2½	2½	2½
1	83690	100	120	150	¾	1½	1½	2	2	2½	2½	3	3
0	105500	125	150	200	1	1½	2	2	2½	2½	3	3	3
00	133100	150	180	225	1	2	2	2½	2½	3	3	3	3½
000	167800	175	210	275	1	2	2	2½	3	3	3	3½	3½
0000	211600	225	270	325	1¼	2	2½	2½	3	3	3½	3½	4
CIRCULAR MILS													
200000		200	240	300	1¼	2	2½	2½	3	3	3½	3½	4
250000					1¼	2½	2½	3	3	3½			
300000		275	330	400	1¼	2½	3	3	3½	3½			
400000		325	390	500	1¼	3	3	3½	4	4			
500000		400	480	600	1½	3	3	3½	4	4½			
600000		450	540	680	2	3	3½	4	4½	5			
700000		500	600	760	2	3½	3½	4½					
800000		550	660	840	2	3½	4	4½					
900000		600	720	920	2	3½	4	4½					
1000000		650	780	1000	2	4	4	5					
1100000		690	830	1080									
1200000		730	880	1150									
1250000					2½	4½	4½	6					
1300000		770	920	1220									
1400000		810	970	1290									
1500000		850	1020	1360	2½	4½	5	6					
1600000		890	1070	1430									
1700000		930	1120	1490									
1750000					3	5	5	6					
1800000		970	1160	1550									
1900000		1010	1210	1610									
2000000		1050	1260	1670	3	5	6						

the location of the motor, an overload and underload protective device must be provided at the motor.

The full load current as well as the permissible size of wires for motor circuits may be obtained from tables in the code; these should be followed in laying out motor wiring. Tables are also given in the code showing the current allowed for the different wire sizes, as well as the conduits allowed for the circuits.

Motors of large capacity should, in general, be connected on single circuits or feeders. Where motors are grouped, a single feeder may be run to a fused junction terminal with tap circuits taken from the cut-outs to the respective motors of the group.

Single-motor circuits should be proportioned for not less than 125 per cent of the full load-running current of the motor. Wires which will be required for motor circuits are:

Direct current	2	wires each same size
Single-phase A.C. current	2	" " " "
Three-phase A.C. current	3	" " " "
Two-phase four-wire A.C. current	4	" " " "
Two-phase three-wire A.C. current	2	" " " "

The neutral or third wire to be 50 per cent larger than either outside wire.

To be concluded in the November issue.

MODERN TENDENCIES IN THE USE OF MARBLE

BY

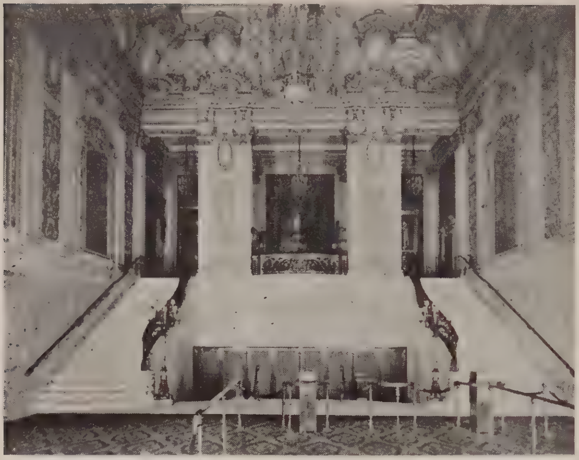
CLIFFORD WAYNE SPENCER

MARBLE in various forms and uses has furnished one of the records of the character of the various stages through which civilization has passed. The marble structures of ancient Greece are a true indication of the severe simplicity of Greek taste, while the riotous luxury of the Roman Empire was expressed in terms of richly colored marbles and brilliant mosaics. And so it has progressed through various color cycles to the present time. Within the period of our own history, very marked tendencies along these lines can be discerned. Beginning with the pure white of the Colonial and Greek Revival periods, popular taste gradually developed in favor of more richly colored decorations, and the result was the "Victorian" style which was characterized by the use of richly colored red and black marbles in connection with highly ornamental oak or mahogany woodwork. Again the wave of color subsided, and for the past two or three decades we have had cool white marble with more recently a decided tendency toward the use of the buff monotones, such as Botticino and Tavernelle. In any town of considerable size, bank interiors and other buildings can be found whose interior treatment is based entirely on the use of buff marble. In fact, buff marble has come to be considered the "bread and butter" of the marble industry, like sugar in a grocery store. The marble yards of the country are stocked with this type of marble, and it can be supplied in large quantities.

But the world moves on, and the pendulum swings rapidly in the opposite direction. There is little doubt that we are now entering upon a new color era, which, stimulated by new discoveries and scientific research, bids fair to go beyond anything we have yet known. Always the builder has loved to work in marble. The effects to be gained by its use are unlimited in number, and its lasting qualities are such that his work will endure. Moreover, no material lends itself in quite the same way to the expression of beauty in color. Its colors are natural, and therefore have unlimited possibilities from the standpoint of harmony. Color is now being used where once it was not even considered, and especially is this true of the modern home. Formerly, little marble was used in domestic architecture except in the most pretentious homes of the very rich. Now, however, it has a very definite place, and lends color to many bathrooms and is being used in mantels, radiator coverings, as well as for many exterior uses. These uses of marble are being very definitely recognized by a new policy which has been adopted by the marble industry as a whole. Marble was formerly sold to dealers by the great producers and distributors in block form only, so that if an architect or his client particularly desired a certain kind of marble for a mantel or lavatory slab, he might find that dealers in that locality did not happen to have a block of that particular variety on hand and could not afford to buy one for such a small order, so that a less desirable variety would have to be substituted or the use of marble abandoned altogether. Now, however, the producers offer to sell marble of any variety in lots of one slab or more, so that the architect can now have much greater freedom in

Entrance to Office Building in Dark, Richly Colored Marbles

Golden Veined Ashlar Walls With Red Levanto Trim



In Elaborately Decorated Interiors, Plain White Marble May Be Used Effectively

The Carpet-like Pattern in Marbles Relieves the Monotony of Wide Floor Areas

making his choice of marbles for such purposes.

In choosing marble for use in a prospective building, there are many points to be considered, and experienced marble men should be consulted in all cases. The choice of marble requires some thought, there being about seven hundred different varieties available in this country at the present time. This does not mean that the choice can be made indiscriminately. For instance, an architect may choose a beautiful marble and base his whole scheme of decoration on it only to find that it cannot be supplied in quantities sufficient for his needs. He may wish to use monolithic columns of such sizes that only a very limited list of marbles can be had with sufficient length to serve the purpose. Again he may find that the physical properties of his chosen variety are such that it is unsuitable for his particular project. All these details should be investigated.

The supply of marble depends not only on the existence of the deposit in large quantities, but on its accessibility and the methods used in quarrying it. There are vast quantities of beautiful stone hidden away in the hills which are so inaccessible that only a very limited supply of them is to be had. The mountains of Colorado have vast deposits which are scarcely touched because of the great difficulty in bringing the marble to market. Some quarries in that state are worked, and we have the beautiful Colorado Yule which is available for fairly large buildings, but which is marketed with great difficulty. Another illustration of this is found in Spain, where there are deposits of the richest marbles, which were so greatly desired by the ancients that they were transported in great quantities to the Italian cities and even to Greece and more distant countries. The retrogression which has taken place in Spain has caused such great confusion in the transportation system that these valuable marbles are quarried only in very limited quantities, and then only for local use. The length of the working season is another factor governing supply. If a quarry can be worked for only three of four months of the year, the supply will naturally be limited. This is the case in many of the quarries located in the Pyrenees and the Alps in Europe, and in Colorado and Alaska and the northern sections of North America. This handicap has been overcome in many cases in this country by using modern quarrying methods, and this is especially true of the Vermont district, where most of the quarries are in the form of tunnels and can be worked throughout the year. The southern districts, such as Georgia, Tennessee, Missouri and Alabama, are of course, not subject to this condition, and quarries there are worked in the form of open pits. Modern quarrying methods are doing much to insure a steady supply of blocks. In this country practically all operations are carried on with mechanically operated channeling and drilling machines, so that a constant supply of blocks can be had with very little waste. In Europe, however, the general procedure has been to blow off the side of a mountain or to split off blocks by means of wedges, and to salvage as much of the debris as possible. There has also been use of wasteful methods in this country, foremost among which are those causing the ruining of the deposits of white marble in New York state, and of the black marble beds in Virginia by blasting. The loss of the Virginia black marble is to be particularly regretted, as it is said to be the most beautiful and uniform black marble found anywhere in the world. These quarries are now being worked for terrazzo chips, and it is possible that solid marble will be reached and that this valuable variety will be made available once more.

The sizes of blocks depend on the formation

Native Utah Marble is Used in this Mantel in the Church Administration Building, Salt Lake City

Domestic Marbles Are Unsurpassed for Giving an Effect of Cleanliness to Shop Interiors

of the strata as well as on the facilities for getting out and transporting the blocks. Many varieties can be had in sound blocks of 5 or 6 feet only, while others are limited in size only by the machinery used to raise them from the quarry. A block of white marble, weighing 63 tons and being 14 feet square and 3 feet thick, was especially quarried for the basin of the Scott Memorial Fountain in Detroit, and monolithic columns can be had as large as 32 feet long by 4 feet in diameter. It is always best to ascertain what sizes are available before planning to use monolithic blocks of large sizes.

Another matter to be carefully considered in choosing marble, is that of the suitability of its physical properties to the conditions to which it will be subjected. Marble is not wholly a scientific classification but a trade name, applied to a certain class of limestone possessing peculiar characteristics. In general, marble is more dense and is said to be "metamorphosed" or "recrystallized" limestone. It is more compact and is generally distinguished from limestone by its ability to take a polish. The line of demarcation between limestone and marble is rather vague, and it is sometimes difficult to tell in just which class to place a stone. In general, marble is divided into three classes according to chemical composition. The calcites are almost pure lime carbonate, while Dolomite marble carries a high percentage of magnesium carbonate, and the serpentine marbles have abundant silicates crystallized with the carbonates. The tensile strength of marble is very great, which fact not only adds greatly to its structural value, but makes it especially adaptable to delicate sculptural ornamentation. The crushing resistance of marble ranges from 11,000 pounds to the square inch to 22,000 pounds per square inch, depending on the variety. Its resistance to heat is especially important in case of fire, and marble is well up in the list of stones in this respect. Under carefully conducted tests, it was found that marble may be subjected to a heat of 12,000° Fahr. without physical change. The freezing of liquids absorbed by stone is very likely to cause disintegration of its structure, but so small is the quantity of moisture that can be taken up by marble (from .06 to .09 by weight) that there is no great danger from this source. This quality of non-absorption is also of great advantage in resisting stains from oils, dyes and other liquids. The quality of hardness is very important, especially where the material is to be subject to constant wear, as in floors and stair treads. Everyone knows how hollows will be worn in stone floors and steps by the passing of countless feet over a long period of time.

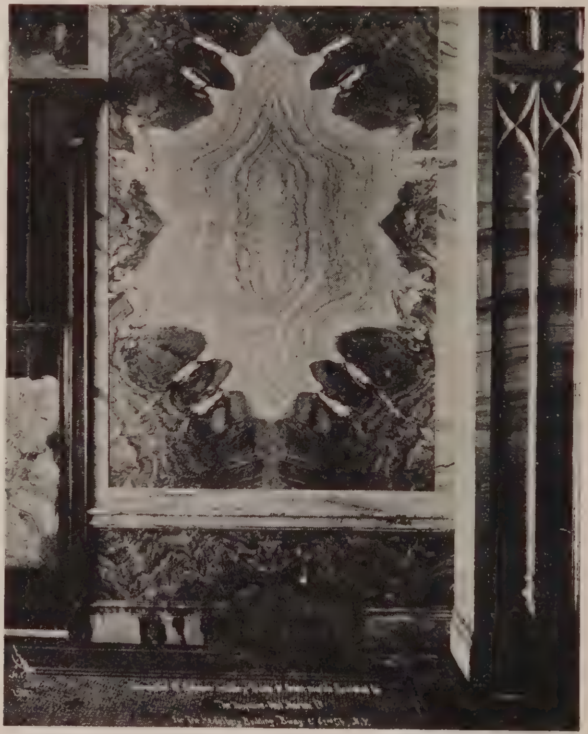
Special care should be taken in using stones of different wear resistance in the same floor, as the floor is likely to become hilly or uneven through wear. An example of this is found in the Union Station at Washington, where a very hard red Champlain marble was used in connection with a softer white marble to gain decorative effect, and the heavy traffic has worn away the white marble leaving the red projecting quite noticeably. The United States Bureau of Standards is making tests at the present time to determine the wearing qualities of floors and the possible remedies, if any. An apparatus has been designed, and tests with this are being compared with a series of measurements of similar materials under service conditions. A paper showing the results of these tests is now ready for publication and should be of great interest. It contains the results of abrasion tests on about 90 materials, including marble, slate, limestone, and sandstone.

Perhaps the most important consideration in choosing marble to withstand special conditions is that of soundness. Many of the varieties most highly prized for their rich color and pattern have, by their very nature, natural fissures and depressions. These defects are successfully remedied by the use of wax and by "sticking" the marble together, and in some extreme cases by cementing it to a "liner" of heavier marble or some other sound stone. It is said that in ancient times it was the custom to specify that marble should be *"sine cera,"* without wax,—and that it was from this custom that our English word "sincere" was evolved. One should not get the impression, however, that marble that is waxed or "stuck" is not an honest product or that its value or durability is lessened thereby. Whatever may have been the practice in times past, the marble industry, in common with the rest of modern business, has adopted the principle that honesty and frankness are the best policy, and if an architect or his client will consult a reputable marble man as to the soundness of a given brand of marble, the facts will not be misrepresented, no matter how much of that particular variety the dealer has for sale. Of course, there are some instances where the use of a highly waxed marble should be avoided. Wax should never be used on exterior marble. It should not be used where it will be subjected to an unusual amount of heat, such as around radiators or as mantel facings for fireplaces. While the color and veining of marble can be matched perfectly with wax, the wax has not the same wearing qualities as marble, and in time a slight change of color or shade may occur in the wax, due to impurities absorbed from the air. For this reason it is sometimes not advisable to use wax in buff monotones or white marble, as the wax which originally matched the color of the marble may change slightly in color and betray itself. An example of this is seen in the Botticino of the Grand Central Building, New York, where the wax veins are quite conspicuous in some places. This as often enhances the beauty as not. The National Association of Marble Dealers has classified the various marbles according to their soundness into these four classes:

Group A.—Sound marbles and stones, which require no sticking, waxing, or filling, and which possess characteristically uniform and favorable working qualities.

Alabama
Alaska Tokeen
Blue Vermont
Caen Stone
Carthage
Chassignelle
Clarendon
Colorado White
Georgia Cherokee
Georgia Creole
Gravina
Italian English Vein
Italian White
Kasota Pink
Lee
Logan Missouri Gray
Mankato Pink
Napoleon Gray
Pentilicon
Red Ark Fossil
Regina
Tennessee
Vermont French Gray
Vermont Lepanto
Vermont Pearl Gray
Vermont Verdoso
Vermont White Grades
Wellington Cream

A Large Variety of Colored and Plain Marbles in The Elks' Memorial, Chicago



Patterned Panels May be Formed of Burled Marble Slabs

Group B.—Marbles and stones similar in character to those of the preceding group, but having somewhat less favorable working qualities; occasional natural faults; limited amount of waxing and sticking necessary.

Alta Vein
Batesville
Belgian Black
Bianco Statuary
Blanco P
Breche Blanc
Champlain Black
Champville
Colorado Travertine
Eastman Cipollino (light)
Eastman Cipollino (dark)
Eastman Cream (light)
Eastman Cream Statuary
Eastman Cream Green (veined)
Glens Falls Black
Italian Statuary Vein
Kasota Yellow
Mankato Yellow
Middlebury Italian
Regal Blue
Travertine
Vermont Champlain Jasper
Vermont Champlain Lyonais
Vermont Champlain Oriental
Vermont Pavonazzo
Vermont Royal Antique
Vermont Swanton Black
York Fossil
Fossgraynel

Group C.—Marbles of uncertain variation in working qualities; geological flaws; voids, veins and lines of separation common; standard shop practice is to atone for Nature's shortcomings by sticking, waxing and filling; "liners" and other forms of reinforcement freely employed.

Alabama
  Fancy Grades
Basseville
Blue Belge
Bois Jourdan
Botticino
Breche Opale
Breche Pavonazzo
Breche Stazzema
Breche Violette
Brecia Fiorito
Campan Melange
Cenere
Eastman Heidelberg
Emerald Curley Green
Escalete
Famosa
Furst Gray
Hauteville
Italian Pavonazzo
Jaune Benou
Juraville
Rosato
St. Genevieve
Skyros "A"
Skyros No. 12
Skyros No. 14
Tavernelle Clair
Tavernelle Fleury
Tavernelle Rose
Tinos
Tranivelle
Verdello
Vermont Verde
  Antique
Verd d'Estour
Verona Red
Verona Yellow
Wallen Gray
Westfield Green

Group D.—Marbles and stones similar to those of the preceding group and subject to the same methods of finishing and manufacture, but embracing those materials which contain a larger proportion of natural faults and a maximum variation in working qualities, etc.; this group includes many of the highly colored marbles prized for their decorative qualities.

Alps Green
Biegenelle
Black and Gold
Breche Oriental
Breche Rose
Brocatelle Violette
Byzantine
Campan Rouge Griotte
Cardiff Green
Cipollino Greek
Cipollino Swiss
Eschaillon
Fleur de Peche
Florido Rose
Forest Green
Genoa Green
Grand Antique
Griotte
Jasos Arobico
Juane De Brignolis
Languedoc
Levanto
Maurin
Monte Aurato
Moreisque
Nebo Golden Travis
Numidian Pink
Numidian Red
Numidian Yellow
Onyx
Portoro Rose
Rosso Aligante
Rosso Antico
Rouge de Rance
Rouge Etrusque
Rouge Royal
Royal Jersey Green
Royal Rose
St. Baume
Siena Gray
Siena Yellow
Sylvan Green
Verde
Vert Antico
Vert Campan
Violet de Brignolis

Another point on which a careful architect should be well informed is in regard to the care that is necessary in maintaining marble in its original state. It might be felt by some that when the building is finished the architect has no further concern. However, if materials which he has selected grow dingy and do not weather well, he will be blamed by many for not having made a wise choice. Then, too, if the owner finds on completion of the work that there is an unusual amount of maintenance cost which he had not expected, he is likely to hold the architect morally responsible. The owner should be warned in advance as to exactly what will be necessary to keep the marble work in good condition. With regard to unpolished exterior marble, it is true of marble as of other stones that "the mellowing influence of time is a great beautifier of architectural work." In the process of weathering, the cold and dazzling whiteness of freshly cut stone takes on an atmosphere of antiquity and warmth that is greatly to be desired. Buildings may be robbed of a distinct part of their charm and dignity through the laborious process of cleaning. Be sure, therefore, that the building actually needs cleaning and will be improved thereby. Sandblast cleaning should never be resorted to, as it removes

A Carved Doorway of Gray Missouri Marble

Colorado Marble is Especially Suitable for Exterior Work

White Vermont Marble is Used Extensively for Public Buildings

the surface and thus lays the stone open to more easily becoming soiled and stained. Also, the sandblast treatment has a tendency to wear down the sharp edges and arrises of the tooling and carving, sometimes to the extent of obliterating them altogether. If the building must be cleaned, the best method is to scrub it with a good cleaning solution and water, using plenty of "elbow grease." Where highly polished marble is used externally, considerable care is required. There is probably only one marble (Westfield Green) that will hold polish indefinitely when exposed to the elements. In all other cases, marble soon becomes dull and dingy, and there is nothing which tends more to give the front of a building a dilapidated appearance than the presence of marble that has once been polished but has lost its luster. Such marble should be gone over regularly, at least once every four weeks with a mixture of beeswax and turpentine and then polished till the original luster returns. In the case of interior polished marble, this is not necessary, but it should be washed regularly to remove the film of grease and dirt that tends to form on the surface and to dim the polish. Of course, the length of time that a marble will hold its polish varies greatly according to the variety. In general, the harder marbles are harder to polish, and for that very reason are likely to retain their polish much longer. There are many preparations for removing all sorts of stains and discolorations from marble, and these are fully described in a booklet called "Maintenance of Interior Marble," compiled by the National Bureau of Standards and published by the National Association of Marble Dealers, 648 Rockefeller Building, Cleveland.

The many conditions under which marble is manufactured in various parts of the country and the varying costs of transportation and setting make it impossible to give any very definite information as to the cost of marble. This depends on the accessibility and extent of the supply. The difficulty by which it is manufactured and transported to the building site is also an important factor. A price for marble quoted in one locality may be utterly misleading

Scale Models May be Made of Actual Marble Samples when applied to an estimate for work to be done in another locality. In general, however, marbles can be said to fall into comparative price classes. The domestic marbles of comparatively slight coloring are in the low price class, along with some grades of white Italian marble. The buff monotones are in a slightly higher class and include Botticino, Buffneato, Montenelle, Beige Nelle, and Tavernelle. The next class includes buffs carrying some color and bringing a higher price, such as Hauteville, Florido, St. Baume and Jaune Lavatine. The next price class includes the Breccias (Roman, Oriental, Rose and Violette), and other colored marbles. A still more expensive group includes both domestic and foreign varieties of reds and dark greens and other highly colored marbles. Marble for exterior use is somewhat higher in price than most of the other materials used for this purpose, and its general use fluctuates with the prosperity of the country. Its great beauty coupled with its lasting qualities and the low cost of upkeep causes it to be chosen in many cases where securing a low initial cost is not important. Many buildings are built of a very beautiful random ashlar which is made of what is practically waste material from the marble mills and can be used at a cost only slightly higher than that of brick.

Exterior marble is most often specified in "sand finish," as this brings out to the greatest degree the natural veining of the stone. It is put on by rubbing the sawed blocks with coarse sea sand. Where a rougher finish is desired, tooling is often specified. The work is done by hand or by a special tool used in a planer. It leaves a slightly corrugated surface, the lines being continuous and evenly spaced. When the lines are irregular and finer than tooled finish, it is known as "axed finish." Rock-face ashlar is also very beautiful for exterior marble work, the face of the block being chipped off after the pieces are sawed, leaving a natural stone finish.

Commercially speaking, marble is any stone that is of less hardness than granite; that is sufficiently close-grained to take and retain a polished face; and that can be obtained in quantities sufficient for commercial use. Many stones that are not strictly marble are considered by the trade as such and are handled by marble dealers and included in lists of marble. Among these is travertine, a very important building stone, widely used for interior ashlar and trim and very suitable for floors on account of its hardness and non-slipping qualities. This is a limestone formed by the action of water in limestone caves. Another stone not properly marble but often considered as such, is onyx, which is composed largely of lime and is formed by the precipitated lime from the water of hot springs. The various kinds of marble are distinguished from one another by trade names adopted in many cases arbitrarily, but usually being descriptive of the coloring or formation of the veining. Thus the term "Breche Violette" is both descriptive of the broken triangular markings and the rich violet coloring. Cipollino marble, which comes from Greece, and which has been used since the days of the Roman Empire, is so named because of the fact that its layers resemble those of an onion. Other varieties are named from the regions or towns in which they are quarried, and many are named from important buildings in which they were first used, such as "Steinway Green" and "Cunard Pink." One variety, which bears the high sounding name "Loredo Chiaro," derives its first name from a combination of the first two letters of the first name and the first three of the last name of the architect who was instrumental in introducing it in this country,—Eddie Lord. Another case of the arbitrary adoption of a name was when some particularly fine gray and gold marble was shown a German architect and he exclaimed in delight, *"famos,"* so this variety has since been called "Famosa."

These trade names do not refer exclusively to the product of any single producer but are adopted merely for the purpose of distinguishing a particular variety from countless others. The distribution of marble deposits is very wide. Scarcely any section of the country is without some such deposit, although most of them are not worked for one reason or another. Quarrying ventures are regarded with a great deal of uncertainty and are considered a highly speculative investment. It would be impossible in the space of this article to discuss all the different deposits and varieties produced in the country. However, some of the more important, from a commercial point of view, can be treated briefly.

The Vermont region, which has been more thoroughly exploited than any other marble-producing district, furnishes a wide variety of high quality marbles for both exterior and interior uses. The West Rutland deposit alone furnishes over 15 varieties ranging from almost pure white statuary marble to dark greens, such as Verdoso and Olivo. The quarries along the Otter Creek Valley furnish good varieties, most of which are white or pearly white with blue or gray markings, among which Pittsford Italian and Florence are important commercial varieties. The Vermont Verde Antique is very well known and is quarried in the central region. Its extreme hardness makes special machinery necessary for quarrying and manufacturing this variety of serpentinous marble. The Champlain reds are very rich in coloring and include Jasper, Oriental, Olive, Lyonais and Royal Red. The Georgia deposits of crystalline marble are particularly adaptable for statuary work and exterior building, two notable examples of its use being in the statue of "Civic Virtue," New York, carved from a single 55-ton block 14 feet x 8 feet x 6 feet, and the McKinley Memorial, at Niles, O. The main deposit of Georgia marble is said to be a solid block four miles long, three-eighths of a mile wide and between 185 feet (known depth) to a half mile (estimated possible depth) deep. It ranges from light, slightly clouded gray to dark gray. There are also a very vivid pink variety and a good quality, even veined Verde Antique available in quantities to supply architects' needs. The Tennessee region is also an important producer of marble, most varieties being of the fossil-bearing class. It is used most extensively for interior work, such as walls, floors, stairways and toilet room work. There are three distinct classes designated by various trade names. The grays and pinks usually have a characteristic wavy black line, called "crowfoot" veining, running through them at intervals. The dark brown varieties are known as Dark Cedar or Dark Chocolate and are of a very rich uniform appearance. They have been produced in large quantities and have been very widely used in public buildings throughout the country. Missouri is also an important marble district, most varieties being of a warm uniform gray with or without black pencil-like veining. A variety that is particularly desirable is the Golden Vein, which has a ground mass of silver gray with occasional golden markings. This compares very favorably with the imported Famosa. The Missouri marbles are especially adapted to interior work and have been widely used for floors and walls in washrooms as well as public lobbies, banking rooms and corridors.

The only marble quarried in important quantities in Colorado is the Colorado Yule, which is found near Marble, Colo. This is an extremely beautiful white-to-gray material, suitable for exterior purposes. The main structure of the Lincoln Memorial, at Washington, is built of this beautiful stone, as are also many other fine monumental buildings throughout the country. Colorado travertine is also available in large quantities and compares very favorably with the foreign variety, being somewhat warmer in coloring than Roman travertine. The Alabama varieties are suitable for both exterior and interior use and are very striking in their vivid, dark, contrasting veining; the best known variety is Alabama Madre Vein. From Alaska comes a remarkably beautiful interior marble of light, pearly gray background, the Tokeen variety having light gray, clouded veining, and the Gravina, very definite black markings. Both are extremely beautiful and are widely used, especially on the Pacific coast. Maryland has important marble deposits, and much marble which was used in the national capitol came from this state. Now, however, most of these quarries are inactive. One of these quarries has recently been reopened and is producing a beautiful soft Verde Antique called Cardiff Green. Another deposit of valuable Verde Antique here was ruined by destructive blasting, and what might have been valuable marble is now being used as railroad ballast. Among the Dolomitic marbles, are those of Lee, Mass., used largely for structural purposes. Another important variety produced in Massachusetts is Westfield Green, famous for its ability to retain its polish when exposed to the elements. The white Dolomite marble of South Dover, N. Y., is an important building stone which is widely used, a notable example of its use being for the Savoy-Plaza Hotel, New York.

France, Italy and Belgium are the principal sources of marble in Europe, although other countries are rich in marble deposits. Italy is perhaps best known for its marbles, and among others the white statuary marble of Carrara is well known for sculptural purposes. Among the highly colored varieties from this country are Black and Gold, Alps Green, the various Breccias, Siena marbles of varying yellow tints, Botticino which has had such general use recently, Pavonazzo, Tavernelle, and a long list of other richly veined marbles. The marbles of France are equally as varied and as richly colored. Among the better known are Escalette, Grand Antique, Hauteville, and the various Breche varieties. From Belgium comes Belgian Black, the standard black marble in use today. There are also Blue Belge, Rouge de Rance, and Rouge Fleuri. The Famosas from Germany are also well known as are several other varieties. Other sections of Europe also are rich in marble, and American marblemen are going about prospecting for new and more beautiful marbles to meet the demand that is sure to develop as we learn to use more and more the beautiful colors nature has given us. Marble must be seen to be appreciated, and a visit to some of the marble sample rooms, which are located in all large cities, is best when there is a choice of marble to be made for architectural use.

THE SUPERVISION OF CONSTRUCTION OPERATIONS

BY

WILFRED W. BEACH

CHAPTER 9. CONCRETE WORK, CONTINUED

THE specification clause on measuring reads: "MEASURING. A systematic method shall be employed for the measurement of all materials, including water. Measurement by shovels or barrows (other than approved measuring barrows) is prohibited. Measurement of aggregates shall be by loose volume, the unit being a 94-pound bag of cement, assumed to be equivalent to 1 cubic foot."

There can be no misunderstanding about measurements of concrete ingredients, but there can be much variation in the accuracy by which this measuring is performed. Contractors, doing their own work, may easily train men to use shovel measurement with fair accuracy and with small economy on minor work, but the method is forbidden on all operations supervised by architects or engineers. Before mixing is started, the barrows should be measured by filling cement sacks with aggregate, then emptying them into the barrows, thus judging the degree of fullness taken up by the required amount; but, inasmuch as a cement sack will contain only about ⅞ cubic foot of sand and slightly less of the coarse aggregate, due allowance should be made for this variation. The barrow capacity can also be measured by dumping cement into it up to the amount of sand specified; or the contractor can have a box made of 1- or 2-cubic foot capacity, to use for a measuring device. This latter is convenient for hand mixing where a barrow is unnecessary. Having determined the barrow measurement, the inspector must see that it is closely adhered to, that all barrows used are identical, and that, where the mix is varied for plain and reinforced work, the change is made in feeding the mixer.

(3). *Cement Must be Fresh, Up to Standard, and Used in Correct Ratio.* The character and quality of Portland cement are matters of laboratory determination. The superintendent of the schoolhouse construction sent in samples for test as soon as he could get them from the first car, and from each successive car thereafter. None was permitted to be used until reports upon it were received. If these had been unsatisfactory, there would have been no alternative but to reject the entire car, if the samples were properly representative of the shipment, and a new source of supply would have been necessary. As was set forth in Chapter 5, it is extremely unlikely that any but acceptable cement will be sent to a job where it is supposed to be tested. Manufacturers do their own testing and know their products. In certain localities, it is customary to specify that each bag of cement shall bear a test tag, and this evidence of quality is supplied by the manufacturers at an additional cost of 10 cents a bag. On small work, this is the best procedure but, on large work, such increase of nearly 20 per cent to the cost of the cement is too heavy a tax. Proper storage and care of cement after delivery will guarantee its suitable condition at the time of use. But if any is overtaken by accident and suffers water damage, it should be discarded and thrown aside at once.

(4). *All Ingredients Shall be Properly Mixed.* On this subject, the specifications say:

"MIXING CONCRETE. All concrete shall be mixed in a rotating batch mixer, except that, under certain conditions, the superintendent may permit small batches to be mixed by hand. Under either method, the materials shall be thoroughly mixed dry, then sufficient water added to produce concrete with required moisture content. A competent foreman shall be in constant attendance at the mixer to see to the correct proportioning and mixing of each batch produced. Mixing drums shall operate at a uniform speed of 200 feet per minute and for a minimum of 1½ minutes after water has been added. Volume of materials per batch shall not exceed the maker's rated capacity of mixer. Machine and hoppers shall be thoroughly cleaned before being allowed to stand idle. For hand mixing, the cement and sand shall first be mixed dry by being turned over three times, then the coarse aggregates added and again turned three times while water is being added to produce the required consistency."

As to the required consistency, this is determined by test, specified thus:

"SLUMP TEST. All concrete mixtures shall be subject to a slump test by the Contractor, once or twice a day during pouring, as requested by the Superintendent and under his direction. For such test, the Contractor shall provide a conical form of No. 20 gauge galvanized iron; also a ⅝-inch pointed metal rod, 21 inches long. The form shall be 8 inches in diameter at bottom, 4 inches at top and 12 inches high. The percentage of water in concrete shall not be in excess of that required to produce a maximum slump of 4 inches for mass concrete and base of floors on earth, and a maximum of 7 inches for reinforced slab, beam and column work."

Greater refinement in slump testing is often met with in specifications,[1] but refinements are not characteristic of such testing, which is merely a rough method of ascertaining in the field whether the concrete is being turned out as moist as desired and whether it reaches the work in that condition. "Inasmuch as the amount of water required will depend upon the dampness of the ingredients, the richness of the mix and the percentage of fine aggregate, it is not expedient to specify any exact quantity of water, and hence the burden is on the superintendent to see that the correct amount is used. Its three-fold purpose should be remembered, viz:

(1) To carry cement in suspension and hold it in contact with the surface it is to bind.

(2) To produce the proper fluidity of mass for best manipulation.

(3) To combine with the cement to bring about crystallization and adhesion.

"The success of concrete work depends upon how well these details have been carried out, to the end that maximum density shall have been achieved."[2]

The first of these conditions results from thorough mixing; the second is demonstrated by the slump test; and the third implies that the water, once mixed with the cement, shall be allowed the proper period of repose and none be permitted to be withdrawn by evaporation, suction or other means. Whereas the specifications permit the superintendent to demand two slump tests a day of the contractor, these are seldom needed except where immense quantities of concrete are being produced. An experienced inspector has learned to judge the output of the mixer by its color and consistency, and hence will not demand frequent tests. While work is under way, other tests[3] may be in order and should receive the attention of the superintendent. Inasmuch as testing during construction can serve no purpose other than to influence greater care in the making of concrete, such tests are not often used, final tests of actual slab construction serving the same end.

There are various methods in use for the regulation of water supply in the mixer, but one finds the "rule of thumb" method most in vogue. With an experienced man in charge, there is no particular objection to this,—but such a man is not always in charge, and hence mechanical regulation is preferable. For large operations, there are on the market mixing devices in which the water supply is regulated by the degree of moisture content in the aggregates as determined by their weights.

Not only is the density of the concrete to be considered in connection with the water ratio, but also the ultimate resistance of the finished product to the forces of disintegration. It is fairly well established that complete crystallization of all the cement in a mass is a very slow process, and hence the importance of keeping concrete moist during curing, as will be brought out more fully later. Concrete improperly hydrated will absorb free moisture to an extent that will cause it to swell. If it freezes in that condition, the swelling is dangerously increased. If it then thaws and later dries out, the mass contracts. As this process is repeated, hair cracks appear, absorbency becomes greater,—and disintegration may set in. But to such a degree as concrete is properly hydrated, to just that degree does it become impermeable to free water and less subject to expansion and contraction and to effects from alternate freezing and thawing.[4]

(5-a) *Concrete Mix to be Deposited Promptly Without Separation of Ingredients.* Concrete mixes are delivered to places of deposit by direct spouting from the mixer, or from a tower and spouting adjoining the mixer, or by wheeled vehicles (barrows, buggies or trucks), or by combinations of these devices. The essential is that the conveyance used shall carry the concrete to its final resting place in time to permit adequate tamping or agitating within the 30-minute limit specified:—

"PLACING. Concrete shall be conveyed to point of delivery in watertight carriers and deposited as nearly as possible in final position immediately after mixing. Re-tempering or unnecessary re-working of concrete will not be permitted, and any concrete placed or disturbed after 30 minutes from the time water has been added to the cement will be rejected and must be removed from the premises. Pouring shall be continuous from working joint to working joint. Each column shall be poured in a continuous operation. Overtime labor shall be provided for these purposes, without extra charge, where such continuity cannot be otherwise secured. If spouting is used, the plant shall be of such size (with spouting at such incline) as to

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[1] The Portland Cement Association, in "Design and Control of Concrete Mixtures," publishes this table of:

Recommended Slumps for Concrete

Type of Structure	Slump in inches Minimum	 Maximum
Massive sections, pavements and floors laid on the ground	1	4
Heavy walls, slabs, beams	3	7
Thin walls, columns, etc.	4	8

(One should note the considerable permissible variation in these slumps and bear in mind that few recommendations as to concrete have any great degree of permanency. The foregoing is from the "Second Edition" of the booklet, "Revised and Enlarged, January, 1927." Later issues may advise changes in these figures.)

[2] W. W. Beach in "Specifications for a Hospital." York & Sawyer, Architects, The Pencil Points Press, Inc., 1927.

[3] See "Specifications for Plain and Reinforced Concrete, Water-cement Ratio Method, A.I.A. File 4b," Bulletin of the Portland Cement Association.

[4] From a "Symposium on the Behavior of Concrete," American Society for Testing Materials, 1923.

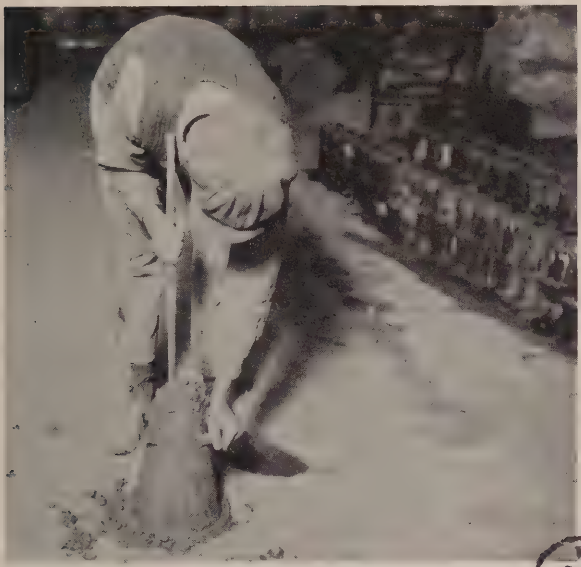

Fig. 11. Rodding the Concrete for Slump Test

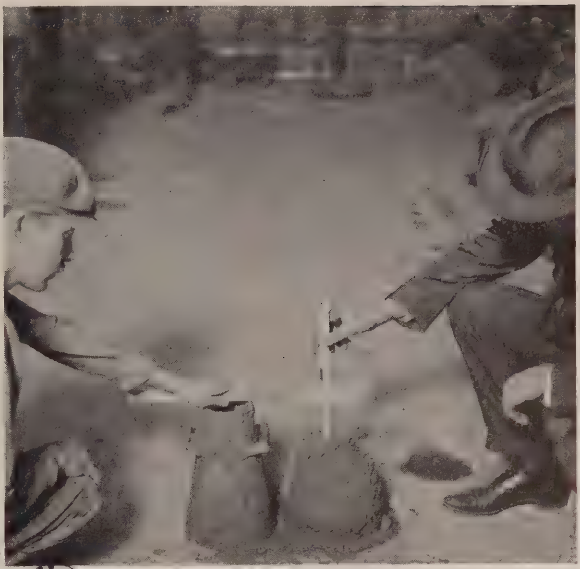

Fig. 12. Measuring the Slump of the Concrete

secure a practically continuous flow during operation. Equipment shall be located as approved and shall be thoroughly cleaned after each run."

Separation of the ingredients is not likely to occur unless flowability has been induced by the addition of too much water in place of giving the spouting adequate incline. Such separation should be compensated for in the forms by the prompt addition of enough cement and sand to take up the surplus water. The mere fact of water coming in contact with unset concrete is not in itself harmful. The cement already in solution will not suffer, but it is most essential that it shall not be washed from the aggregate it is supposed to cover. Thus, concrete can be successfully deposited under water, provided that no current is permitted to pass against or through the mass and carry away any of the cementing element. This is effected by the use of special vessels (tremies) designed to dump the mix directly in its permanent position where it may be lightly tamped but not otherwise disturbed. Material so deposited should have a slightly excessive cement content to compensate for probable losses, and should be most accurately placed. It is not unusual for an entire job of the kind to be lost through some minor miscalculation.

(5-b) *The Newly Deposited Mix to be Adequately Agitated.* Whereas the density of concrete is dependent largely upon the proper grading of the ingredients, it is no less important that each atom, duly coated with liquid cement, shall rest in the closest possible juxtaposition to those surrounding it. As stipulated in the specifications:—

"DENSITY of all concrete shall be effected by thoroughly puddling, rodding, churning or otherwise agitating the wet mass to remove all air pockets and water holes and prevent honey combing of surfaces; but no concrete shall be agitated after the time limit specified."

This means elimination to the greatest possible degree of all air bubbles and water pockets, to avoid the possibility of there being cavities produced by evaporation. Agitation of the mix for this purpose is done by means of spading, rodding or churning the wet mix as soon as deposited, or by pressing an air hammer against the outside of the forms, or by tapping them with a hand hammer. "Honey combing" or pitting of surfaces is due to failure to surround the larger aggregates resting against the forms with fluid material,—strictly speaking, a defect in the agitation process. Except for mixes deposited under water and for dry mixes deposited on earth, the word "tamping" is no longer found in the best concrete specifications, since flowable mixes deposited in forms require tools other than the tamp. The initial set of Portland cement is assumed to begin about 30 minutes after it comes in contact with water; hence, under no circumstances, should it be disturbed in the slightest degree after that time. Contractors are likely to ignore this and have a way of asserting, with real confidence, that the "second set" of cement is as good as the first,—or practically so. There is no foundation for such belief, and hence the only safe course for the superintendent is to know that all cement is still fresh at the time of deposit and undisturbed after the 30-minute period. The custom in vogue by some mechanics of shoveling stale droppings back into the mix is to be deprecated. The saving attempted is not worth the chance being taken.

Habit is so strong with concrete workers that it is sometimes found that gangs accustomed to paving and sidewalk work cannot be depended upon to follow specifications for reinforced construction. They persist in mixing too dry and in not sufficiently rodding the work, especially in deep forms. They are accustomed to following specifications which call for deposits in layers and tamped, which means rammed,—not rodded. Only recently have the better specifications ceased demanding that concrete in walls and similar masses shall be deposited in tamped layers from 8 to 12 inches thick. Such work is not monolithic, though that is the ideal condition at which we are aiming. When poured at considerable depth, therefore, as in column forms, the inspector must see that long, thin rods are vigorously used all around the reinforcing and other inserts and against the forms, but that such agitation shall not extend beyond the material just deposited. The same is true if compactness is sought by hammering the outside of the forms by hand or power hammers. The new, not the old, must be adequately attacked.

The dual importance of properly proportioning and mixing concrete and of correctly placing it implies, on work of any size, an omnipresence on the part of the inspector quite outside the sphere of human ability. One simply cannot watch the mixer and the place of deposit at the same time. This means that by the time the pouring is about to begin, the superintendent must have made up his mind as to the character of the contractor and his workmen,—whether or not they are to be counted upon to try to fulfill the specifications, or if attempted cheating is to be expected.

If in doubt, the architect should be notified and an opportunity given to have one or more additional inspectors assigned. The work of inspection starts well ahead of the pouring, as is evidenced by this specification paragraph:

"SUPERVISION. Before starting any pouring, the Superintendent shall be notified and given opportunity to inspect all surfaces which are to be covered and all members intended to be embedded. The Contractor shall also have a capable man (more, if needed), who shall watch the forms just ahead of pouring, see that all reinforcement and other built-in members are rigidly supported in proper position; all tags, chips and other refuse removed; all needed sleeves placed; all pipe and conduit ends plugged and all surfaces ready for the concrete. He shall strengthen all form supports as needed to prevent deflection or spreading.

"CLEANING FORMS. No concrete may be poured until all rubbish has been removed from the forms and they have been brushed clean and drenched just ahead of pouring (except in freezing weather) and the rubbish holes at bottoms of forms properly closed."

Thus are the duties of inspection at this juncture set forth in the specifications, with but one exception, which is treated of in the next section.

(5-d) *New Concrete to be Properly Bonded to Previous Work.* This is also covered in the specifications quite fully:

"CONSTRUCTION JOINTS. Each run of concrete shall be carried vigorously to completion. All temporary joints in walls or floors shall be at right angles to the run of work. Where reinforced floor work is stopped before an entire area is finished, joints shall be made in beams, joists and slabs under uniform load near middle of span. Where beams receive concentrated loads from connecting beams, the construction joint shall be located not less than twice the width of connecting beams from supporting beams. Beams having loads derived from a single connecting member shall have no construction joints. A 12-hour interval shall be allowed between the pouring of columns and that of beams and slabs. Construction joints in walls and piers shall be horizontal or vertical in all cases and shall not occur within 12 inches of a concentrated bearing. Dowels shall be constructed in all horizontal joints and continuous tongues in all vertical joints."

Then, under "Pouring",—

"UNFINISHED CONCRETE, against which new concrete is to be poured, shall first have the dowels removed, then be drenched and treated with thin grout or approved bonding cement."

It is customary to pour footings before wall forms are built, as a matter of convenience, whether or not they are of same ratios, and regardless of whether either is reinforced. Applying the paragraph on "Construction Joints" to those between footings and the superimposed walls, it is apparently necessary to lay dowels in the upper surface of the footing. For this purpose, it is customary to use vitrified brick or pieces of stone of about the same size or larger, laid half their depth in the wet flux at intervals of about 3 feet; or blocks of beveled plank, 2 x 6 x 18 to 30 inches, are pressed into the surface, to be removed when work is resumed. But, if a dampproofing layer is called for on top of the footings, as in the work of which we are writing, it is necessary that the dowel shall form a continuous beveled edge trench (as shown in Fig. 8), and hence planks must be prepared and laid in, to produce such a trench. Similar planks are set vertically in forms to make the tongues continuous.

It is obvious that the natural roughness of the aggregate in an unfinished surface is of assistance to the bonding of the new material laid against it, and yet the time such a surface may stand before being considered "old" and not amenable to bonding is not well established. There is no apparent reason for this other than that it is customary to continue a day's work anywhere that is found convenient on the job, regardless of the time when the last concrete was poured in that locality. This is careless procedure, since it is evident that any concrete that has been quiescent for 30 minutes has taken its initial set and should not be disturbed or, if it has been in place for two or three hours, it will not readily amalgamate with new material. Therefore, the experienced superintendent will size up a day's work in advance and will see that each section poured is either complete in itself or is "bulkheaded off" with the construction joint members called for, so that they will be there when needed, regardless of whether the time lapse is one hour or 24. Workmen or their foreman, unless such procedure is insisted upon, will not ordinarily start setting construction joint members until the middle of the afternoon, apparently assuming that any concrete surface is "new" during the day on which it is poured. To this cause are to be attributed many "weepy" walls which, even though waterproofed, will transmit water along the lines of structural joinings.

(5-e) *Concrete to be Deposited Only Against Surfaces in Proper Condition to Receive it.* Not only must all surfaces of previous pourings be known to be in fit condition, but *all* surfaces of every character that the mixture will reach, including everything that is to be built in, must be inspected and passed upon. This is reiteration of the duties of inspection described in the preceding chapter, to which reference should be made. A good superintendent will, as soon as he finds the right man in the builder's crew, train him to inspect the work just ahead of pouring, as required by the specifications, and he must be able to depend upon him for such assistance. Once started right, a good concrete gang will coöperate with an apt superintendent; but, improperly managed, they may prove extremely difficult.

(5-f) *Concrete to be Properly Protected Until the Final Set is Complete.* The specifications on this subject read:

"PROTECTION. Concrete poured in warm weather shall be kept thoroughly wet after initial set and for 7 to 10 days or more thereafter dependent upon outside temperature. For all concreting carried on during freezing weather, such special precautions shall be taken as will obviate all danger of injury by frost. Only boiling water and heated aggregates shall be used. Frost shall be drawn from all surfaces with which fresh laid concrete is to come in contact, by blowing with live steam or drenching with boiling water, or both. An adequate enclosure, heated by continually fired salamanders, shall be maintained for the protection of work after pouring, and same shall also be covered, while fresh, with sand or straw and tarpaulins. No concrete may be poured, except by special permission, on days when the temperature at 9 a. m. is less than 25° above zero, Fahr."

The guarding of green concrete from dangers of undue heat or cold is of the utmost importance. Covering and moistening are correct preventives against the former, are easily attended to, and should be insisted upon as essential to proper curing. But protection against cold is much less simple, though no less necessary. "A. I. A. File 4c4" of the Portland Cement Association gives "Specifications for Making, Placing and Curing Concrete in Cold Weather" and also describes "Cold Weather Protection for Reinforced Concrete Works," particularly stressing the latter. These specifications are preceded by this warning: "Adequate protection of concrete against damage by frost during the making and early curing period is *absolutely essential* whenever temperatures below 40° Fahr. are likely to occur within that period. The use of a *definite and complete specification* governing such protection *is imperative* if real assurance of an undamaged and completely satisfactory structure is to be obtained." From a perusal of these specifications and directions, it can be readily understood that the carrying on of concrete operations in freezing weather is not a project to be lightly undertaken,—is not warranted, except in cases of extreme emergency and when the contractor is fully equipped for proper procedure. It is to be noted that the Portland Cement Association, in this publication, says that "the use of salts, chemicals or other foreign materials in the mix to lower the freezing point of the concrete is prohibited," but that "within certain limitations, calcium chloride or calcium oxychloride may be used in Portland cement mixtures to hasten hardening and to increase early strengths." But this whole subject of cold weather concreting is one for the attention of a superintendent of experience. He must needs be well versed in the specifications and protection methods described and have a working knowledge of their practical application. The less experienced inspector should have recourse to the paper just quoted and other authorities on the subject,—then wait for better weather, if possible to do so. If work must proceed, regardless of weather, he should see that *all* recommended precautions are taken, as no one can afford taking the chance of a failure of concrete construction.

Recapitulating, our superintendent on the schoolhouse project arranged to be notified just before the first concrete was deposited in the footing trenches in the southeast corner. He inspected the bottom, had some earth droppings removed, and ordered some loose earth above to be shoveled back, to prevent further droppings. He had previously made his final check of dimensions and approved them, after slight corrections. The mix for footings was specified to be 1:2½:5, with a 2-inch maximum aggregate, while that for basement walls was to be 1:2:4, with a 1-inch maximum. Owing to this difference (and for general convenience), the contractor had two mixers on the job, one of fair size in connection with his stationary concrete plant, and a smaller portable mixer which he proposed using for the footings, for mortar and for other minor work. Thus, the concreting was started on the morning of Monday, April 23, just two weeks from the day ground was broken,—and they were still two days ahead of their schedule. Thereafter, for many days, the chief task of the superintendent was in watching the concreting, the formwork and the placing of reinforcement and other built-in members. The experienced inspector, knowing what factors to watch in the manufacture of his concrete, gives them his closest attention. Other materials are brought on the job ready-made, but, during the making of concrete, his building is transformed into a factory, the output of which is its own structural framework or some of its most essential parts. The ease with which some of the vital members of the building may prove defective is indicated by an extract from the report of a committee of the Detroit Engineering Society dated November 2, 1925:

"The character of structural concrete now being obtained in this city is a matter which is causing grave concern to all who are thoroughly informed regarding local conditions.

"Tests made from a number of the large local construction projects have indicated that concrete, as being produced, is, in general, very deficient in strength as compared with its strength assumed in the design calculations."

There is no good reason to suppose that conditions in Detroit were very different from those prevailing elsewhere in the country, or that they have since improved to the extent they should.

"Various reports and papers classify the causes of defective concrete and of failures. They are:

1. Poor cement.
2. Defective aggregate.
    (a) Stone not durable (as used in the Nashville bridge).
    (b) Aggregate not clean.
    (c) Presence of too much clay or organic matter.
3. Impure water.
4. Improper mixture.
    (a) Poor grading of aggregates.
    (b) Excess of water.
    (c) Insufficient mixing.
5. Poor workmanship.
    (a) Segregation.
    (b) Inaccuracy in proportioning and in controlling the quantity of water.
    (c) Carelessness in placing.
6. Improper curing.
7. Insufficient protection or heating in cold weather.
8. Removing forms too soon.
9. Poor design.
10. Shrinkage and expansion after set.
11. Corrosion of the metal.
12. Localized abnormal changes of temperature.
13. Action of alkalies or sea water, or trade wastes or sewage or atmospheric fumes.

This is a long list, and there may be other causes."[1]

Another writer on the subject[2] says that the reasons for poor concrete have been thus proportioned: "90 per cent from poor workmanship; 8 per cent from using poor aggregates; 2 per cent from using poor cement." He says that fine aggregates need very careful examination, and cites a case where concrete gave trouble because use was made of water from a stream affected by a factory using chemicals; another where disintegrating stone in a dirty car became mixed with broken stone otherwise all right; another where sand, otherwise usable, contained many grains injuriously coated. Verily, when dealing with concrete, no superintendent can be too alert.

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[1] From "Steel for Strength and Security," by George F. Swain, Professor of Civil Engineering, Harvard University.

[2] R. S. Greenman, American Society for Testing Materials, 1914.

CHAPTER 10

THE SUPERVISION OF CONSTRUCTION OPERATIONS

CONCRETE REINFORCEMENTS AND OTHER BUILT-IN MEMBERS

AMONG the first materials to arrive at the school site were the steel bars intended to be used as concrete reinforcement. Since it is not possible for a superintendent to determine by inspection whether such bars are of the quality specified, the architect must be satisfied in this respect with what is supplied or must have recourse to laboratory tests or their equivalent; or, still another alternative, may specify a proprietary brand or brands of bars which he prefers.

Inasmuch as the variation in the quality of reinforcing bars on the market is not great, it is more economical for the designer to base his calculations on the poorest grade of material the market offers, using a commensurate factor of safety. On minor work, such procedure is probably warranted, rather than to subject the owner to the expense of employing an accredited testing laboratory. But on work of any importance, especially on public work such as the school building we have under consideration, it is common practice in the better offices to specify that such materials shall be tested. Such specifications may call for "new billet stock of structural grade" or "either re-rolled rail or new billet stock," in "rounds or squares" or "deformed bars of approved design and make," all to be "of full length required and accurately bent to details and meeting all requirements of the latest standard specifications for such materials as issued by the American Society for Testing Materials and subject to test (at Owner's expense) by a standard testing laboratory as directed by the Architect." Our school building specification further provided for use of a steel wire fabric of definite description in certain locations, and stipulated generally that "all reinforcing materials and inserts shall be free from paint, oil, dirt, scale or excessive rust." There were also the customary provisions as to the submission and approval of shop drawings, and a specification for placing reinforcement which stipulated, among other things, that it must "be correctly placed, rigidly wired together at each intersection with No. 18-gauge annealed wire, and carefully maintained in exact position and clearance, horizontally and vertically."

Operating under these specifications, the superintendent permitted the unloading and sorting of bars in the space allotted, pending receipt of advice regarding samples sent to the testing laboratory. The following day, he and the foreman received copies of schedules and bending diagrams, and men were at once set to work cutting and bending the members first needed. Bars are purchased by builders, either in accordance with diagrams and lists or in bulk quantities, to be formed on the site. Where bars are of simple shape and do not exceed 1 inch in diameter, there is supposed to be economy in the latter procedure. In either case, the superintendent must carefully check all sizes, shapes and quantities and see that the bars are properly sorted and stored under the direction of a man of sufficient intelligence and authority to prevent improper withdrawal at time of usage. In a location remote from a base of supplies, such as the site of the work we are discussing, the incorrect placing of any structural member in finished work implies a like misplacement of another and may be the cause of much annoyance and delay. This is to be particularly avoided in the case of reinforcement because of the crowding of concrete pourers on the heels of those placing the steel.

The first bars placed were in certain footings where they were supported up from the ground on small concrete blocks prepared for the purpose. The practice of using pieces of stone for this, or that of laying the bars on the ground and permitting the tampers to lift them slightly when concrete is poured is not sanctioned by good usage. Broken stones or pebbles tip easily, and hence are undependable for the purpose; nor should the bars rest upon the tops of small stakes as is sometimes done. Use of chairs, such as are commonly used in form work, is not practicable on soft earth, therefore the recourse to use of blocks of some sort. Bats of hard-burned common brick are permissible as chairs in footings, but in this case the superintendent had recently rejected the local brick, so he cautioned the foreman to have the pieces of concrete cast and in readiness, fearing possible delay in the receipt of better brick.

Since the design of reinforced concrete footings is based upon the location of tension members in certain relation to the encasing slab, it is incumbent upon the superintendent to see that such relationship is adhered to reasonably well. This, of course, applies throughout all reinforced work, but one finds workmen less careful with footings than when dealing with relatively smaller members. An instance of this is the case of an octagonal spread-footing, 18 feet in diameter, with 4-way reinforcement. A drawing of a section through the footing showed the first tier of bars 2 inches up from the bottom, and the others at successive intervals of 1½ inches above, making a total of 4½ inches between the centers of the first and top tiers. The architect witnessed the laying of the lower tier, then went to another part of the work. Returning a half hour later, he found that the tiers had been placed 6 inches apart, and hence the upper layer was close to the top of the 2-foot-thick slab. The foreman had failed to consult his drawings. When the concrete was promptly ordered out, he appealed to the contractor who, though a man of much experience and good repute, backed up his employe and made an issue of the matter. The work was on a cost-plus basis and, the architect standing by his decision, the owner decided in his own mind that he and the contractor were abused and stood the expense of making the correction. The architect didn't learn, until the owner employed someone else for his next project, that the contractor's contention that the architect was overly particular in matters of minor import caused the owner to believe that this was a foible that tended to make work emanating from his office unduly expensive. Of such slender threads is an architect's standing fabricated! Not only must he, as a superintendent, be most meticulous in discerning use of incorrect materials and placements, but he must anticipate such improprieties, catch them at their inception, if possible, in order to save time, expense and avoidable argument!

It is not unusual for a contractor to complain that an architect's supervision is too intermittent,—that it is not fair to the owner or builder to demand removal of materials, no matter how inferior or badly placed, discovered several days after installation. There is a certain degree of justice in this claim, and hence it is important that an architect, at the time of his employment, should make the point clear to the owner, explaining just what is to be expected as to number and frequency of visits under the terms of the contract; and that too extended intervals between inspections do not enable one to either check up the dishonest contractor or offer adequate assistance to one who is striving to do his best. The architect should urge upon the owner the need of the constant attention of a clerk-of-the-works at certain times during construction or under certain conditions that may be encountered on any construction work, and should reserve the privilege of assigning one (at the expense of the owner) at any time he thinks it advisable to so protect the owner's interests. Some architects, in order to avoid the waste of perfunctory visits at stated intervals, especially on out of town work of lesser importance, arrange their remuneration for supervision on a per-trip or per-diem basis. Then, if the work goes smoothly, the owner is spared all expense of unnecessary supervision.

In connection with the inspection of placement of reinforcing materials, too much stress cannot be laid upon the importance of knowing that every piece is in the exact location intended before pouring begins. Heavy rods are awkward members to handle, and slight inaccuracies in bending will tend to throw them well out of position. Chairs are easily neglected or displaced, wiring carelessly done and not always with the right kind of wire. A bar more than an inch out of place may not be subjected to the stresses computed for it or it may not receive the proper amount of protective covering. No doubt many expensive failures could have been traced to carelessness in such particulars. When one is supervising building a factory . . . engaged in the manufacture of artificial stone in monolithic form, one cannot well afford to permit the slightest detail of production operations to be slighted, but must bear in mind that the "personal equation" of each operative is bound to be reflected in the finished product.

Perhaps too little emphasis is ordinarily given to the considerable difference between supervising an ordinary lump-sum contract and one that is let on a cost-plus basis. In the case of the former, the inspector is concerned only in seeing that the owner gets what he is paying for, but with a cost-plus operation it is necessary also to know that the work is being economically handled as well as being honestly accounted for. Economical handling implies that each employe be suited to his task and produces as nearly to maximum capacity as can reasonably be expected. That there is much waste of labor in building is beyond question, some of it beyond prevention. In this, as in almost everything connected with construction procedure, all depends upon the foreman. And the greatest of labor waste can be found in slipshod concrete operations. An example of this was displayed by a gang of six men engaged with a mixer of small capacity. Two were wheeling the sand and gravel, two were wheeling the flux (four barrows to each charging), the "straw boss" was handling the cement and operating the mixer, and a college youth in rubber boots was agitating the flux in the forms. Having his eyes open, the latter suggested a change which was put into effect, whereby each charge was contained in two full barrow-loads, thus promptly releasing the mixer for recharging and speeding it up 100 per cent. Then the young man undertook to wheel and empty both barrows and do the small amount of necessary tamping as well, and releasing the two loafers who had been lazily wheeling half-full barrows. By the efficiency thus effected, the labor cost was reduced by one-third and the product doubled, turning it out at exactly 33 1-3 per cent of what it had been costing. This is an extreme case but an actual instance, and serves to show the need of watching labor action when one is paid to safeguard the owner's interest in it.

In addition to inspection of reinforcement placing, the superintendent must concern himself with each of the various members that should be in its correct position and there effectually secured before concrete is poured. He must be advised regarding all trades that will want to install members in or through concrete, ascertain that they have been duly notified, and see that such items are in place or that sleeves or boxes have been set to provide necessary holes for later installation and anchorage. Specification requirements as to who shall provide such sleeves and boxes and who shall place them vary in different offices, but they must, in any case, be most definite, or confusion and protest will result. Some architects stipulate that the concrete (or general) contractor shall provide all needed sleeves and boxes for such purposes and that the contractor for each interested trade shall "direct the placement" of all that are demanded for his work. Others say that each trade shall provide and install its own sleeves or shall provide the sleeves and oversee their placing in the forms. This last is probably the best practice, though the chief requisite is that there shall be no doubt or foundation for argument as to who is to do which.

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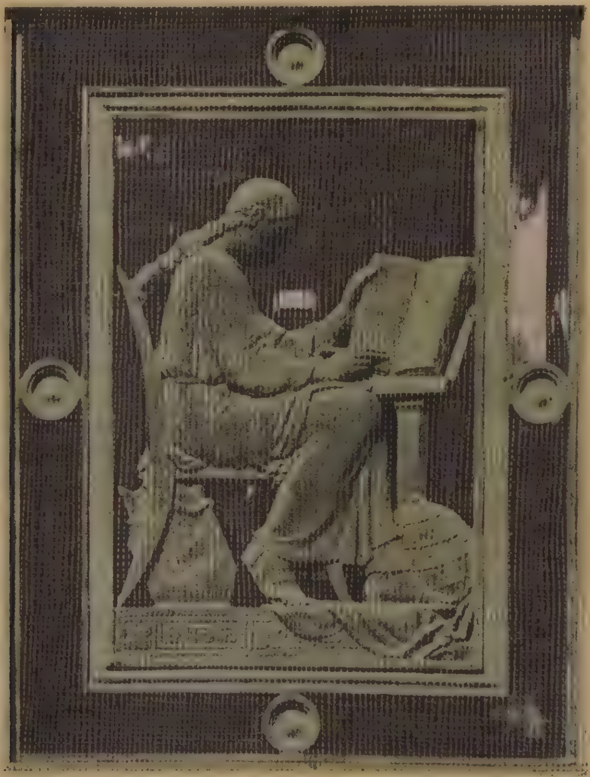
THE ARCHITECTURA FORUM

IN TWO PARTS



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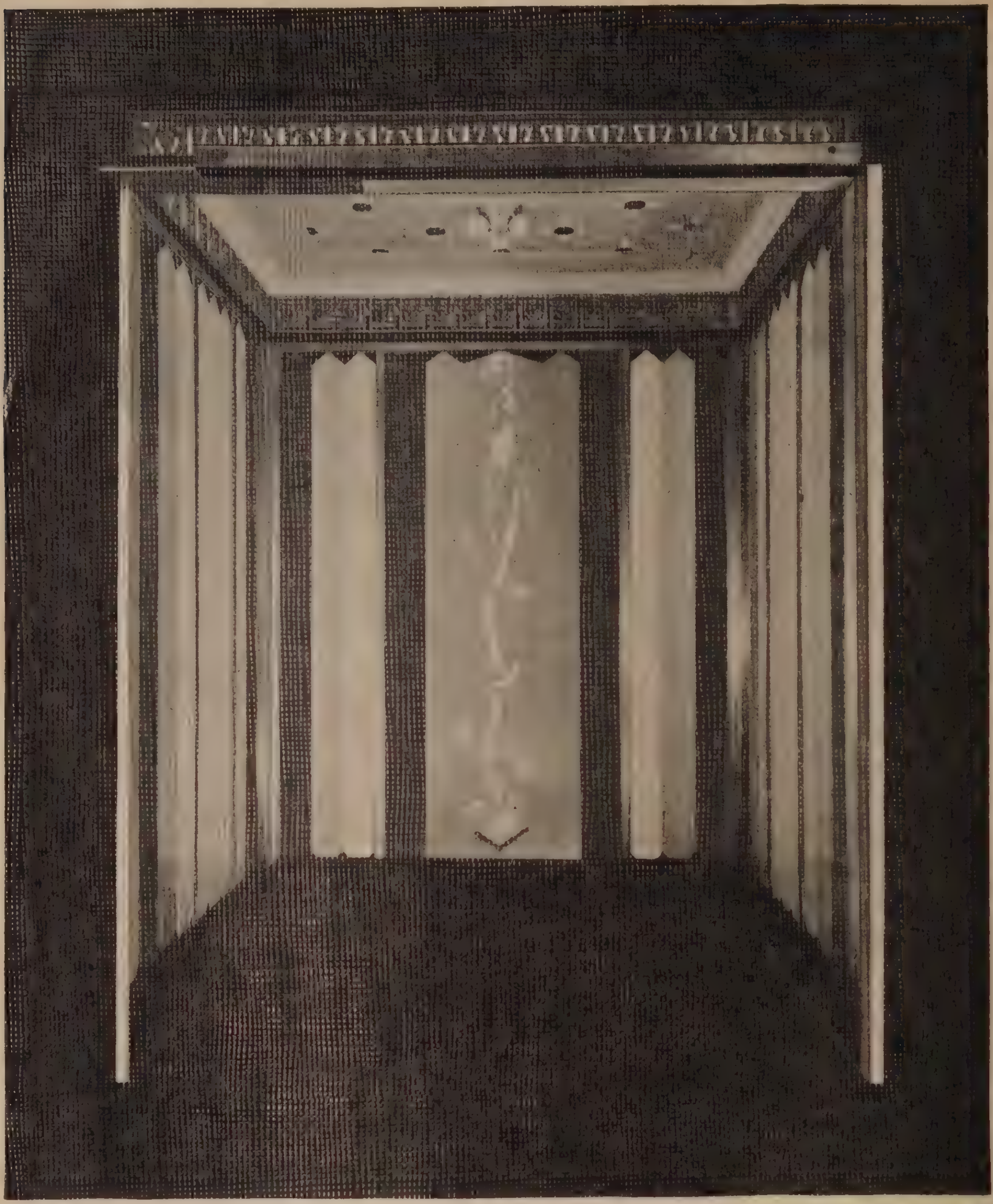

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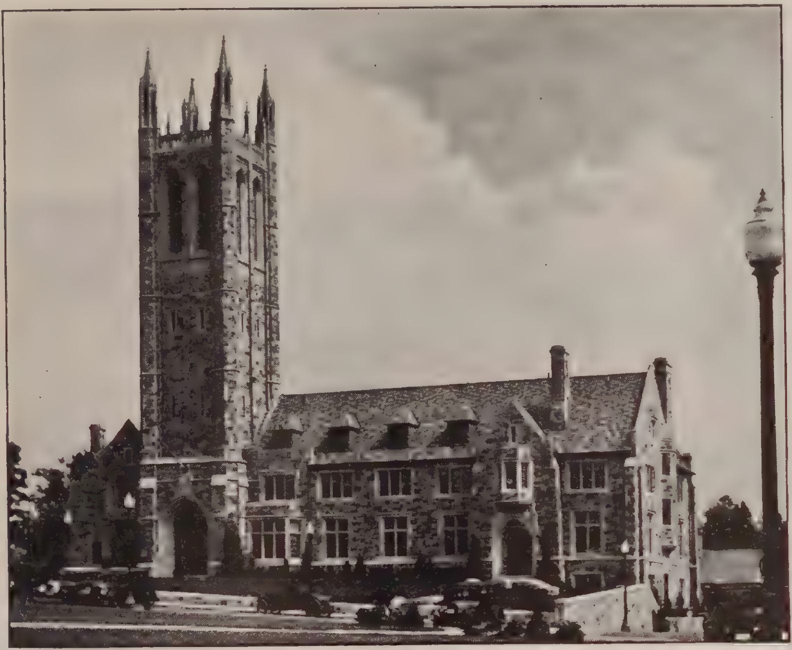

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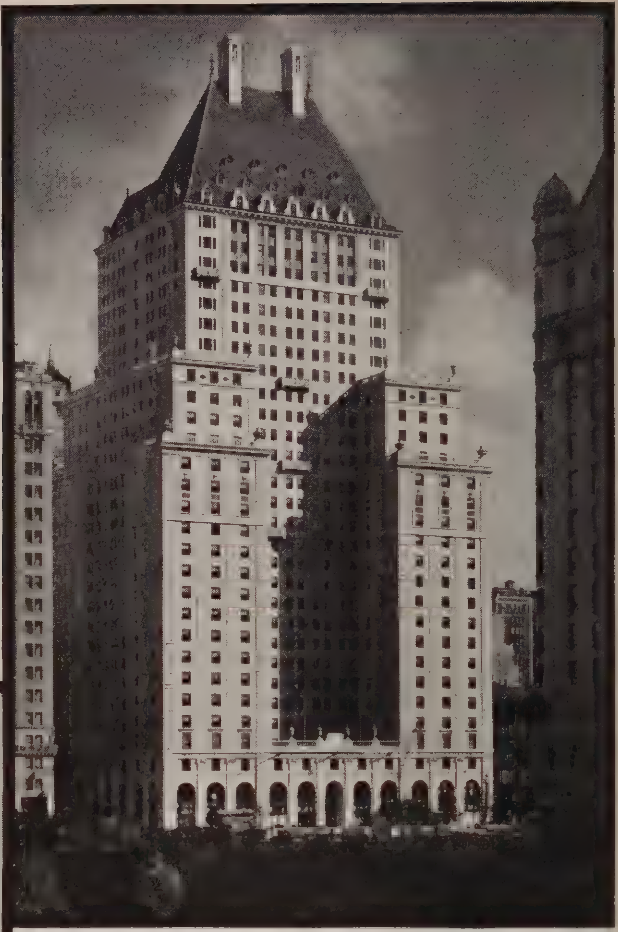
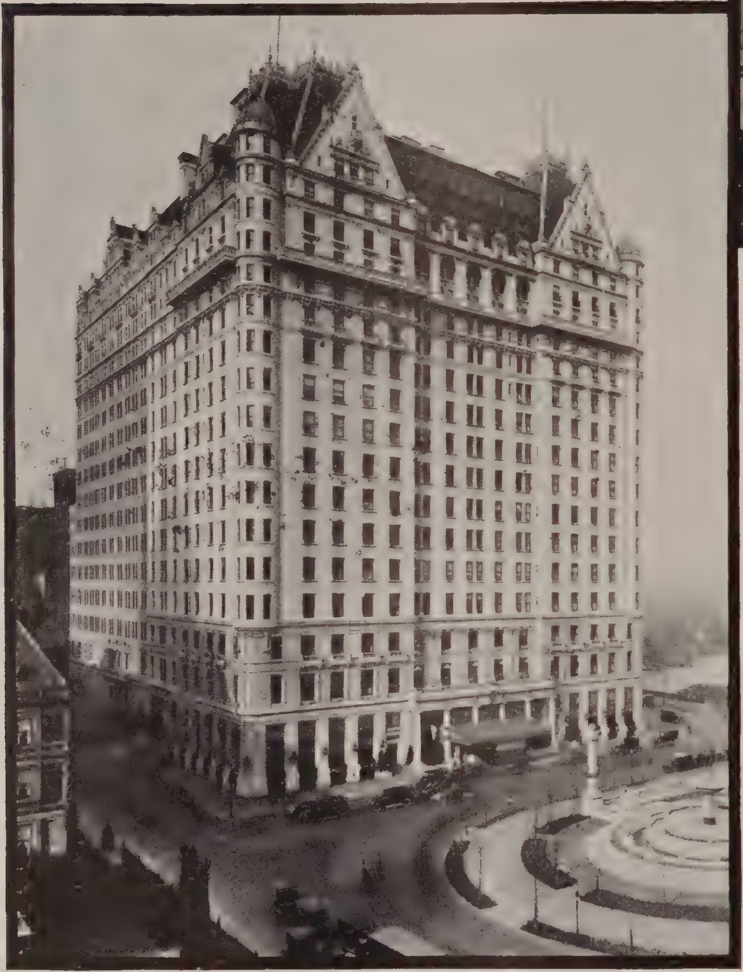


Savoy-Plaza Hotel, New York City. McKim, Mead & White, Architects



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A REVIEW BY

MAXWELL RUTHERFURD

ALTHOUGH the present trend in architectural design and building has afforded an unprecedented increase in the number of new and improved materials, and although new methods and machinery have been introduced for using the older building materials advantageously, there has been a very marked tendency on the part of designers and craftsmen toward cheap imitation of one material by the use of another, both of which have definite inherent characteristics of beauty. The unfortunate part of such imitations is that in the attempt to make one material look like another it neither attains the beauty of the imitated material nor retains that which is naturally inherent in itself. Cement, terra cotta, or plaster may be and are very beautiful when used in such a way as to take full advantage of their plastic properties, but when in their use an attempt is made to simulate natural stone, the imitation is almost always so obvious and the result so forced and unnatural that from a standpoint of beauty the material has been wasted.

This practice of imitation and simulation has resulted, of course, in most cases, from an attempt on the part of the architect to produce an effect of extreme richness without the expenditure of the necessary amount of money. Clients are almost always anxious to achieve a rich and prosperous effect, but at the same time they demand that the cost be kept within strict limits, and the poor architect is driven to all sorts of expedients and subterfuges in the attempt to satisfy unreasonable demands. On the other hand, there are many instances where the imitation results from a surprising lack of knowledge on the part of the architect himself or of his designers and draftsmen as to the natural characteristics of a material or the way in which it should be used. Designs which are not based on a fair knowledge of the way in which a thing is to be made seldom attain real beauty, and they are likely to be extremely difficult and costly to make. Wrought iron is especially susceptible to this sort of treatment, since a great many people do not

A NEW EDITION OF A STANDARD WORK

"A History of Architecture on the Comparative Method"

By Sir Banister Fletcher, F.S.A., F.R.I.B.A.

IT is not necessary to point out to architects and architectural students the merits of this widely known work on the history of architecture. For several decades it has been read and studied or used as a work of reference because of its being authoritative, concise and well documented with references and bibliographies.

But it is sometimes possible to improve even a well known and standard work, and the History of Architecture, now appearing in its Eighth Edition, has been revised and enlarged, and considerable new matter has been added. The Eighth Edition possesses every valuable characteristic of the earlier editions, and it includes, besides, the results of recent travel and research to increase its value.

929 pages; 6 x 9½ ins. About 3500 illustrations.

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Small Manor Houses

AND

Farmsteads *in* France

By Harold D. Eberlein
and Roger W. Ramsdell

Chateau de Missery, Cote d'Or

IN all the wide search for architectural types in which to design and plan the American home, there has been found nothing more beautiful and appropriate than what is called "French Provincial," the term applying to the better order of farm houses, *manoirs,* and even to minor chateaux. It is a type full of graceful informality along with the touch of dignity or sophistication which renders it just a trifle formal; it is expressive of eighteenth century charm, and it suits admirably the needs of the present-day builders of suburban or country homes. In the refined and slightly reticent exteriors of the old French country houses, much emphasis is placed upon excellent architectural lines, while their interiors show carefully arranged and spacious rooms with well placed chimneypieces, doors and windows.

This excellent and authoritative work should be in the library of every architect whose practice includes work of any kind of residence character. It brings to the attention of American architects a type which is fresh and new without being freakish. It includes 254 illustrations from original photographs showing subjects complete as well as in great detail, together with many measured drawings and perspective plot plans. Flat Quarto (7½ x 11 ins.), bound in handsome library blue buckram, stamped in gold, uncut edges with gilt tops.

In a Box—Price $15

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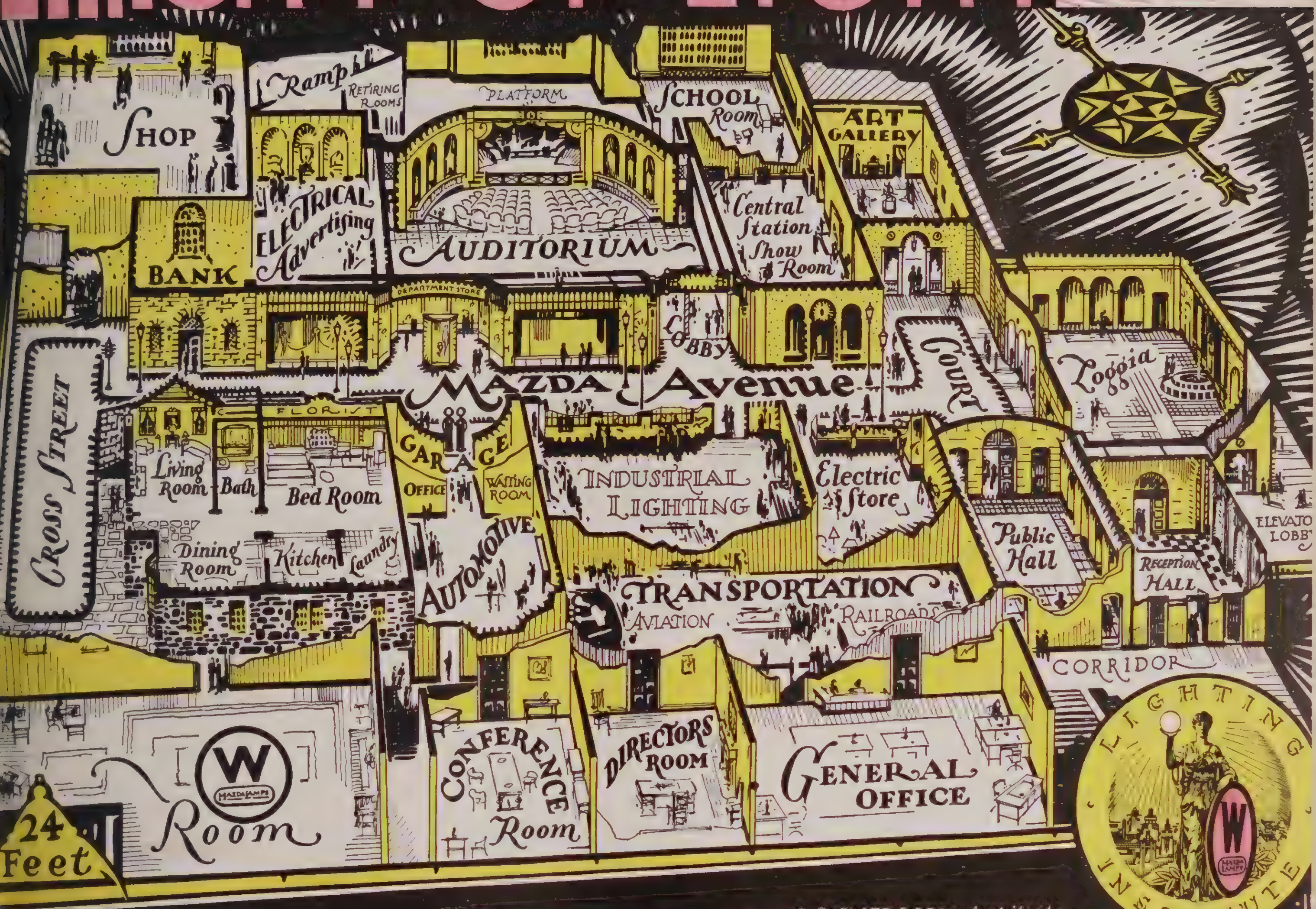
properly appreciate the difference between wrought and cast iron or the peculiar qualities of form and texture that give wrought iron its rugged beauty. A draftsman will often prepare drawings for such a thing as a handrail having twisted bars for balusters and a delicately moulded rail, the balusters being as difficult to cast as is the rail to execute in wrought iron, and the whole will be labeled "wrought iron" and sent to the craftsman who, no matter how clever he may be, will not be able to do justice to himself or to his material. For a good understanding of wrought iron there is no substitute for a visit or a series of visits to a forge, and it would be even more helpful if the designer were able to actually take part in the working of the iron himself. In this way he would learn all the limitations and possibilities latent in the material and how to provide for properly using them in his designs. Familiarity with technical process is useful.

Wrought iron at the present time is experiencing a great deal of popularity. Many people are beginning to realize the great beauty and decorative possibilities of this material, which was so universally used in early times but which for many decades has, in a general way, fallen into disuse due to the greater economic advantages of cast iron. The recent era of prosperity and the undoubted rejuvenescence of good taste have created a demand for work in this medium which offers great opportunities to the architect who is equipped to make the best use of the material.

Wrought iron, being so completely the result of hand craftsmanship, the workers themselves must have great enthusiasm for their work and a considerable amount of artistic taste, so it is always well to select a good craftsman and entrust much of the detail to his good taste, since he knows the best way in which a design may be executed in iron much better than the majority of architects. Not only must he control the shapes and sizes of the different pieces and parts, but as a great deal of the beauty of wrought iron depends on the texture, he must use a good deal of common sense and good taste in working up the finished surface. Since the raw material of the forge is now usually purchased by the smiths in a great variety of regularly shaped stock bars, it is the custom of many smiths to produce the hand-hammered texture demanded by a great part of the public by beating the metal and deliberately disfiguring the surface. This method is not considered good practice unless the entire surface is covered, it being more desirable to start with a bar larger than the size desired and draw it down to the required size. In this way the natural wrought iron texture is attained, and the surface is made harder and more rust-resistant, it being an established fact that the more iron is worked under the hammer the more rust-resistant it becomes. It is always to the interest of the architect to select a highly skilled, artistic, conscientious craftsman to execute his designs, but often this is impossible due to the methods of open competition, and in such cases it is even more important that the architect have a good knowledge of smith work and be able to closely supervise the work of fabricating the iron. It is not absolutely necessary for the designer to know the name of every tool, but it is very desirable that he understand the use and function of the more important implements.

Another result of the lack of understanding on the part of those who design wrought iron is the unnecessarily high cost of ironwork, the design of which is more

THE CITY OF LIGHT



F. P. PLATT & BRO. Architects

VEN THE STREETS ARE PAVED WITH

SEALEX LINOLEUM

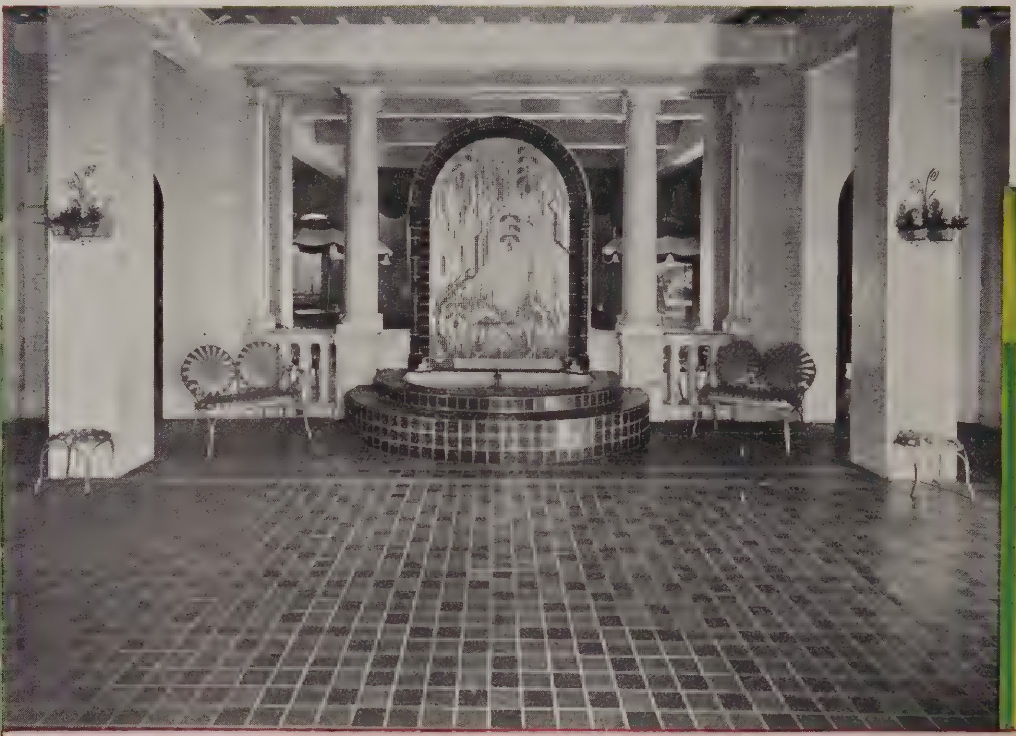
THIS is a map of the City of Light—a model city with streets you can walk on and stores you can enter—all built on a single floor of a New York skyscraper. F. P. Platt & Bro., the architects who planned this unique city for the Westinghouse Lamp Company, have made it a comprehensive exposition of correct lighting practice in all types of buildings.

Incidentally, it has turned out to be a striking demonstration of the versatility of Sealex floors. With one or two unimportant exceptions, every floor in the City of Light is built of Sealex Linoleum or Sealex Treadlite Tile.

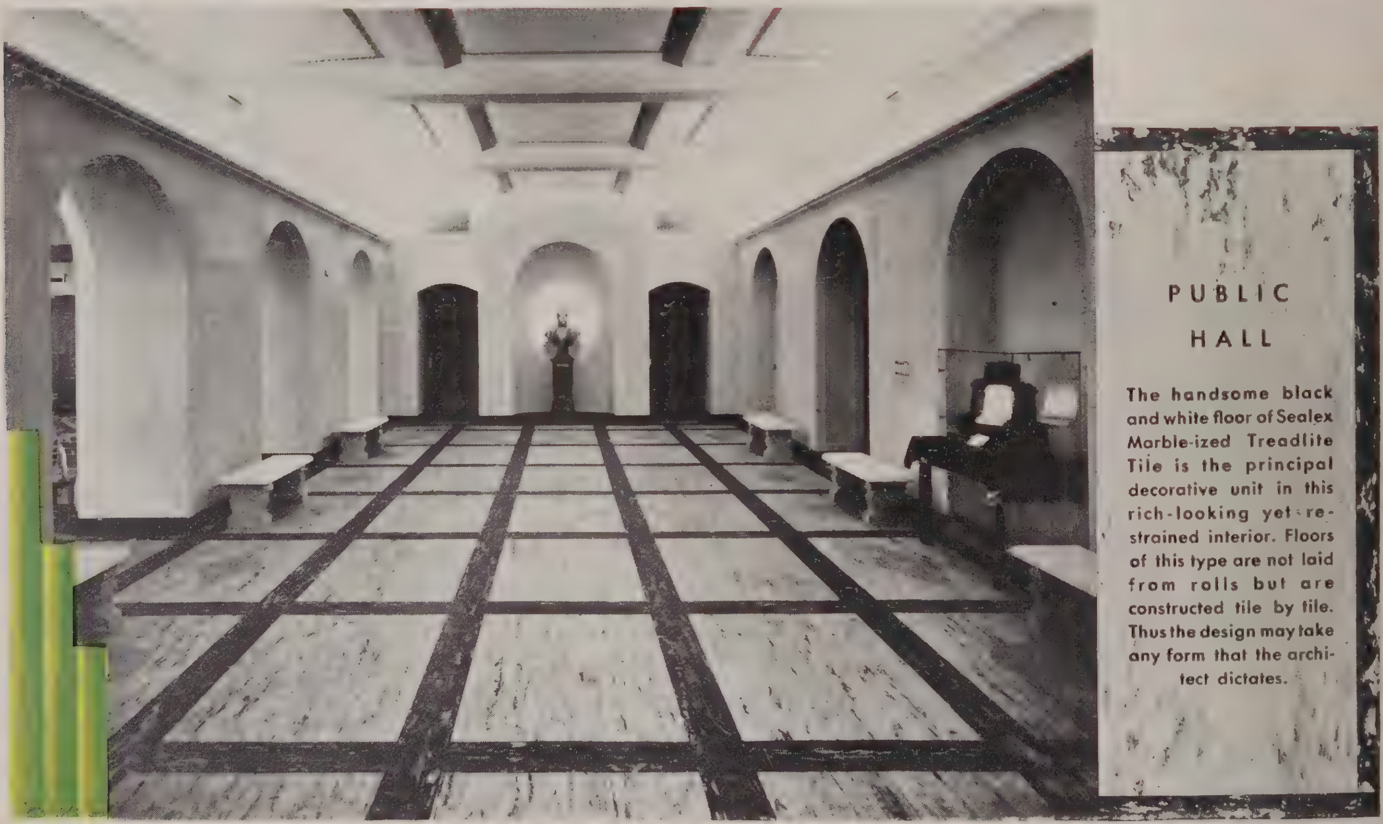
The Westinghouse Lamp Company extends through us a cordial invitation to all architects to visit the City of Light. It is on the 7th floor of the Grand Central Palace, 46th Street and Lexington Avenue. Seeing this group of beautifully executed interiors, complete in every detail, is an experience which should be particularly stimulating to architects. The following pages will give you some idea of what is in store for you.

See following page

SEALEX LINOLEUM



LOGGIA This floor of Sealex Embossed Linoleum ("Evergreen" pattern) has all the pleasing shadings and texture of hand-laid tiles, plus the advantages of quiet resilience and economy. As a matter of fact, the ceramic tiles in the fountain blend perfectly with the tiles of the linoleum floor.



PUBLIC HALL

The handsome black and white floor of Sealex Marble-ized Treadlite Tile is the principal decorative unit in this rich-looking yet restrained interior. Floors of this type are not laid from rolls but are constructed tile by tile. Thus the design may take any form that the architect dictates.

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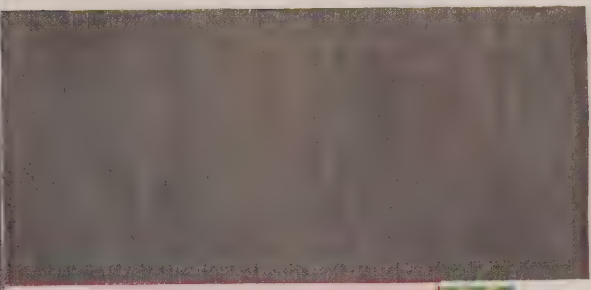
IN THE CITY OF LIGHT



STREET SCENE

The effect of a flagstone walk, around this completely appointed bungalow is produced with a laid-to-order floor of gray Sealex Jaspé Linoleum.

SEALEX Linoleums and Sealex Treadlite Tiles constitute a medium which permits the architect to give free rein to his creative imagination. Practically any floor design that he conceives can be worked out in these "responsive" materials.

With this thought in mind, let us examine a few of the Sealex floors in the City of Light:—

In the loggia (illustrated at top of opposite page) the architects put a touch of their own individuality into an "all-over" pattern of Sealex Embossed Linoleum by inserting broad lines of gray Sealex Jaspé Linoleum. Two of these Jaspé strips may be seen in the picture, immediately in front of the fountain.

The main reception hall (not illustrated) is decorated in the ultra-modern manner. In the floor, a very interesting effect has been obtained simply by enlarging the scale of the design. Each Sealex Treadlite Tile in the checkerboard pattern measures 28 by 28 inches. These "over-size" units harmonize perfectly with the unusual modern furnishings and lighting fixtures.

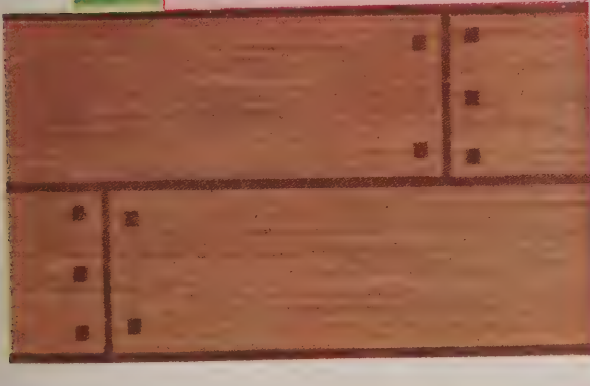
The public hall (illustrated on opposite page) shows Sealex Treadlite Tiles playing a dominant role in a more formal interior. Note the cut-to-order diamonds and circles.

Practically all the floors in the City of Light, no matter how radically they differ in appearance—whether laid from rolls or tile by tile—are Sealex floors. They were all installed by one flooring contractor. They are all kept clean and in good condition by the same simple and inexpensive methods.

It goes without saying that our experience in designing and installing these and numerous other out-of-the-ordinary floors is constantly at your service. Would you be interested in receiving samples of our materials, photographs of unusual installations, descriptive literature? If so, write us.

BUNGALOW ROOM

The "Mayflower" design in Sealex Linoleum brings back the sturdy charm of the hand-hewn floors of our ancestors.



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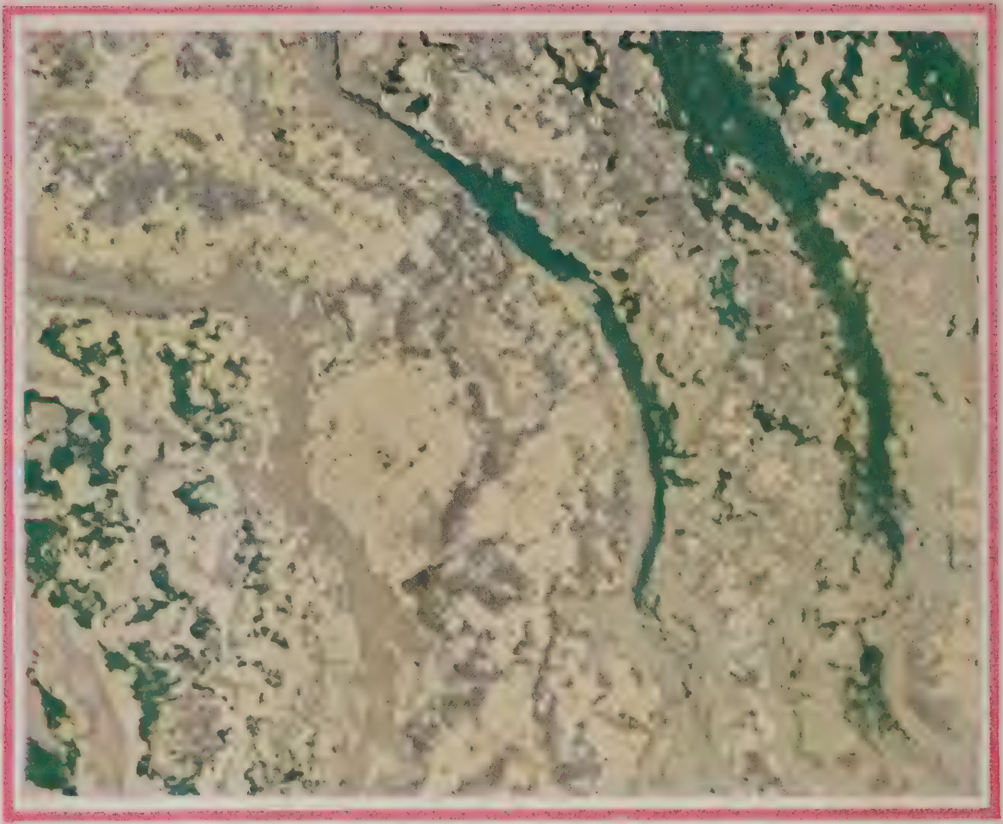

NEVER BEFORE SUCH MATCHLESS REALISM

ASTONISHING that a man-made machine should be able to equal the gorgeous accidental beauty of nature. But it has been done. For proof, look up above at the reproduction of a single marbled tile from a Sealex Inlaid Linoleum pattern.

In this, and other Sealex patterns of Karnean Marbled Inlaid Linoleum, you encounter the most delightful unpremeditated effects. Strange green whirlpools. Little unexpected dashes and splashes of orange and black. Flickering red flames. Here and there, a vivid streak of color sweeping across the tile like a flash of lightning.

Such distinctiveness and colorful beauty are something new in linoleum. Architects will find that the Sealex Linoleum of 1930 is a design element they will take delight in using.

A book showing the complete line of 1930 patterns in Sealex Linoleum will be ready about December fifteenth. We will be glad to reserve a copy for you. Please write our Architectural Service Department.

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See preceeding pages

suited to cast than to wrought work. Many architects seem to expect a "smith to achieve in iron what a carpenter could attain in wood, a sculptor in stone, or a foundry in cast bronze,"—and at an equally low price. As in other branches of design, the pattern of wrought iron to be successful must be structural. The ironwork must be designed to serve a purpose, and the decorative members be so distributed and formed as to best serve the structural function of the article being designed. The practice of placing bits of so-called decorative ironwork on the facade of a building merely to relieve the blankness of a space should be generally condemned, and such unnecessary expedients as use of balcony rails set a bare 6 inches from a blank wall are one of the abominations of modern architecture. The work of early wrought iron workers owes much of its beauty to the facts that the blacksmiths were also the designers and that they worked with a very definite idea of making a useful object in the simplest and most direct manner. Wrought iron is essentially made up of a series of square, rounded or twisted bars with flat hammered plates, and any attempt to introduce other forms in a wrought iron design leads to unnatural and unsatisfactory appearance as well as to almost prohibitory expense.

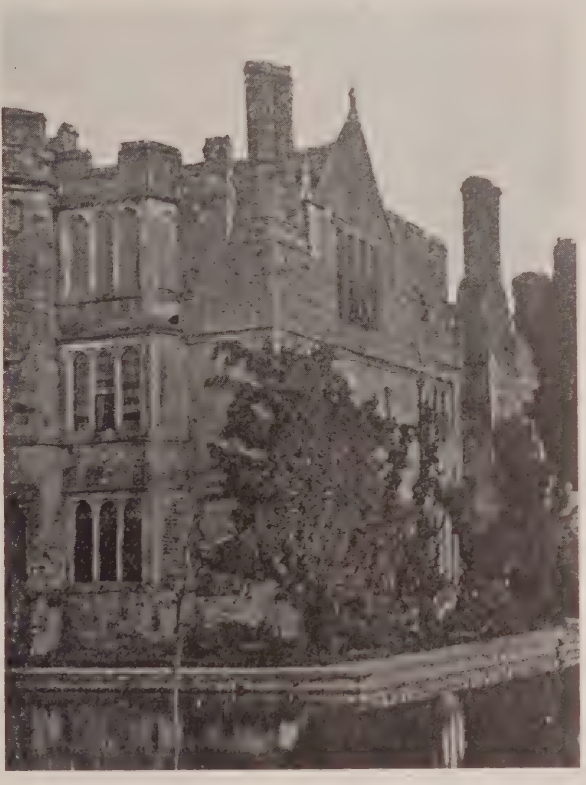
As in other branches of art, wrought ironwork has taken certain definite forms and characteristics according to the various countries and periods in which it has been made, ranging from the severely simple cottage fixtures of England, France and the American colonies to the richly florid Baroque of the late Spanish and Italian Renaissance. Examples of all sorts may be found in the great cities of Europe, and it is unfortunate that the usual architectural traveler is too much preoccupied with his study of the more impressive features of the well known buildings to give proper study to the choice bits of ironwork to be found in the humbler dwellings.

Exhaustive treatises and collections of illustrations and drawings have been published on the subject in every land, but it has remained for Gerald K. Geerlings to compile the first really exhaustive work covering all countries and periods in a general way from the purely architectural point of view. In his volume "Wrought Iron in Architecture" he brings out very forcefully the realization that we are guilty of many shortcomings in our attempts to introduce wrought iron into modern American architecture, and he describes the processes, implements and materials of wrought iron working in such a way as to give the architect a good working knowledge of the subject and to enable him to approach the task of designing wrought iron in a really intelligent and efficient manner. The information gained from this book, supplemented by visits to the forges of good craftsmen, should lead to a great improvement in the quality of ironwork and show the way to designing it in such a manner that the cost will not be prohibitive, as has formerly frequently been the case. The description of wrought iron craftsmanship is especially valuable and interesting, as it brings out many facts which the author feels the designer should know in regard to the actual forging of ironwork, such as the properties of wrought iron and the best kind of raw iron to specify, the texture (legitimate and otherwise), and a fairly complete description of the wide variety of tools with which the smith is accustomed to do his work, and some description of the way in which each is used. The section on "Archi-

"The Domestic Architecture of England During the Tudor Period"

By THOMAS GARNER *and* ARTHUR STRATTON

A New, Larger, and Better Edition of an Architectural Classic



HEVER CASTLE, KENT.

¶ "Garner and Stratton" invariably comes into use when an architect is working in the Tudor, Elizabethan or Jacobean style. Its brilliant illustrations of old buildings may be depended upon to afford precedent for modern work and to supply inspiration for adapting these marvelous styles to present-day use. The difficulty of securing the two volumes, their unusual size, and the fact that they have dealt chiefly with elaborate work have hitherto prevented their wider use.

¶ A new, enlarged and improved edition of this important work overcomes these objections. The page size of the volumes has been considerably reduced, their contents much enlarged, and the additions to the subject matter deal largely with work of the simpler, more moderate character which is adaptable to use in America today. The two volumes abound in illustrations of exteriors and interiors of domestic buildings, and these illustrations are supplemented by countless drawings of details,—half-timber work; chimneys; wall paneling; doors; door and window surrounds; mantels and chimneypieces; ceilings; stairways; interior vestibules, and the other details which mean so much to the designer and aid so powerfully in creating the atmosphere belonging to these English styles.

2 volumes. 237 Pages of Text. Cloth Binding, 210 Plates, 12 x 15 ins.

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tectural Design, Motifs and Ornamentation" will naturally be of great interest to the architectural reader, since it points out the design motifs best suited to ironwork and the forms which bring out its most important characteristics as well as giving some valuable pointers on some shapes that give an appearance of being very rich and costly while actually they are quite simple of manufacture and might be much more frequently used.

A few small marginal pen sketches illustrate some very useful tricks and forms to be employed in the making of wrought iron. The historical sketches which precede the illustrations of wrought iron of the various countries will be very useful in putting the designer in the proper frame of mind to approach the task of making designs from precedents afforded by the illustrations, which will in the fullest measure express the characteristics of the style and period in which the design is to be placed. Italian art of all kinds is among the finest in the world, and it is no more than is to be expected that the wrought iron of Italy presents splendid examples of the blacksmith's art. The cathedrals and chapels are especially rich in iron railings and grilles, and these together with balcony rails, standard holders and iron-studded doors furnish the subject for a wealth of photographic and measured drawing precedent. The wrought iron of Spain in many ways excels that of any other country, and it is perhaps true that Spanish architecture has depended more on wrought iron for its effect of richness than has that of any other country. The majority of Spanish wrought iron designs are so rich in decoration and detail and are so intricately wrought as to put them well nigh out of the realm of possibility for the modern architect to hope to employ them in his buildings, and yet for those who have the vision resulting from a true knowledge of craftsmanship, they offer great opportunity for restrained and beautiful adaptations in a more economical manner to suit modern needs.

The drawings and the illustrations of rich Spanish decoration in iron shown in the present volume, while in many cases rather bewildering in their mass of detail, will suggest to the discerning student of wrought iron many new possibilities in its simple manifestation.

According to many eminent authorities, the ironwork of France has been more uniformly good than that of any other country, and the work of the French craftsmen has had a strong influence on that of iron workers of all other countries. The ironwork of the English, German and Flemish smiths is also well illustrated and described, as is likewise that of America, the latter being divided into two sections, the first section treating wrought iron of the early period up to the twentieth century. The beautiful railings, grilles and balconies of such American cities as Philadelphia, Charleston and New Orleans are here shown in profusion, both by illustrations from good photographs and clearly presented measured details. The second section, on twentieth century wrought iron, is especially interesting, since it shows up-to-date tendencies as portrayed in the work of such master craftsmen as Samuel Yellin, Edgar Brandt and the Iron Craftsmen. Some space is devoted to special fixtures, and the final chapter deals with specifications.

WROUGHT IRON IN ARCHITECTURE. By Gerald K. Geerlings. 200 pp., 14 x 16 ins. Price $7.50. Charles Scribner's Sons, 597 Fifth Avenue, New York.

"CHURCH BUILDING"—*By Ralph Adams Cram*

(A NEW AND REVISED EDITION)

THE improvement which has accompanied the progress of American architecture during recent years has been no more marked in any department than in that of an ecclesiastical nature. This has been due primarily to the rise of a few architects who by travel and study have acquired much of the point of view from which worked the builders of the beautiful structures which during the fourteenth century and the fifteenth were being built over all of Europe. These architects have closely studied the churches, chapels, convents and other similar buildings in England, France, Spain and elsewhere, and the result has been a number of American churches of an excellence so marked that they have influenced ecclesiastical architecture in general and have led a distinct advance toward a vastly better standard. This improvement has not been exclusively in the matter of design, for plans of older buildings have been adapted to present-day needs, and old forms have been applied to purposes which are wholly new.

THE appearance of a new and revised edition of a work which is by far the best in its field records this progress. Mr. Cram, being perhaps the leader among the architects who have led this advance, is himself the one individual best qualified to write regarding the betterment of ecclesiastical architecture. The editions of this work of 1900 and 1914, which have for some time been out of print, have now been considerably revised and much entirely new matter has been added, which in view of the change which has come over ecclesiastical building of every nature is both significant and helpful.

Illustrations used in this new edition of "Church Building" show the best of recent work—views of churches and chapels large and small, in town and country, buildings rich in material and design and others plain to the point of severity, with the sole ornament in the use of fine proportions and correct lines. Part of the work deals with the accessories of the churches and their worship.

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THE EDITOR'S FORUM

A PERSONAL MEMORY
HENRY FORBES BIGELOW, ARCHITECT

AT Beverly Farms, Mass., on August 12, 1929, Henry Forbes Bigelow ceased to be the center of a happy family life and passed from the circle of his friends. The first days with their somber sense of loss have passed, but fond memory will not pass while memory lives.

To one who knew him at work and at play, in wearied and in merriest moods, in the companionship of travel at home and abroad, there comes a desire to express a thought on his unpretending excellence. In recalling his varied activities, in his professional work, in public service and in his personal relationships, one is reminded of Newman's reflections on the attributes of a gentleman: "He is mainly occupied in merely removing the obstacles which hinder the free and unembarrassed action of those about him; . . . . he makes light of favors while he does them, and seems to be receiving when he is conferring. . . . He is never mean or little in his disputes, never takes unfair advantage, never mistakes personalities or sharp sayings for arguments, or insinuates evil which he dare not say out. He is patient, forbearing, and resigned on philosophical principles; he submits to pain, because it is inevitable, to bereavement, because it is irreparable, and to death, because it is his destiny."

"Harry" Bigelow was all of this. In the face of difficulties a valiant spirit furthered fine achievement, but trusted friends saw in him a personal modesty consistent with the youthfulness of his spirit. Of fine praise devoted to himself, we can hear him say, "Come now, nothing like that about me." It was this trait of mind in a person of rare ability that helped to make him rarer still. He left behind him good works and a heritage of affectionate memory.—Boston, September 20, 1929.

FRANK GOODWILLIE

WE regret to announce the death of Frank Goodwillie, A. I. A., on Monday, October 7, 1929, at Montclair, N. J. Mr. Goodwillie, who was a member of the New York Chapter of the A. I. A., and of the Architectural League of New York, had been in practice many years. Prior to 1922 he was in partnership with Frank E. Wallis, but since then and up to the time of his death he has been in partnership with William Edgar Moran. Mr. Goodwillie designed and planned many important structures, including the Manice Building in New York, the Globe Indemnity Co. Building in Newark, the Nela Park plant of the General Electric Co. in Cleveland, and numerous residences. During the World War he served under the Housing Bureau in charge of contracts; since then he has devoted much time to committee work in the American Institute of Architects.

A SERIES OF ONE-FIRM EXHIBITIONS

THE Exhibition Committee of the Architectural League of New York has decided to hold during the coming season a series of one-firm and one-man exhibitions at the Architectural League House, 115 East 40th Street, New York. The first of these exhibitions will include photographs and drawings of recent work of the well known Chicago architects, Holabird & Root. This exhibition will open on November 14 and continue through December 12. The names of the men or firms whose work will later be exhibited will be announced as soon as arrangements have been completed. The holding of this series of exhibitions marks a new departure in the policy of the Architectural League. Heretofore exhibitions of architecture and the allied arts have been confined to their annual shows which have been held either at the Grand Central Palace or at the galleries of the National Academy on West 57th Street. As in these large exhibitions it is possible to show only a few examples of the work of the architects or firms exhibiting, in many cases much splendid material is left out on account of lack of space. It therefore seems advisable to the Exhibition Committee to hold each season a series of exhibitions in the gallery at the League House, in which the recent work of one man or of one firm can be displayed more fully and completely than is ever possible at the annual exhibitions. Besides the work of prominent architects, the sculpture and the mural painting done by leaders in these fields of art will also be shown from time to time.

CONFERENCE ON CHURCH DESIGN

ON December 6 and 7, at the Statler Hotel, St. Louis, there will be held a conference on church architecture. The winners of the Christian Herald Second Annual Church Architectural Contest will be announced, and the Christian Herald exhibits for both 1928 and 1929 will be displayed. Some of the church bureaus will have displays of church architecture, and there will be manufacturers' displays. Among other subjects, will be treated and discussed: The modern church plan and design. Building for religious education. How far precedent should influence modern church design. How may the public be educated to demand better church architecture? How may architects promote a demand for better architecture on the part of local church building committees, etc.? The requirements for building for worship in American churches. Opportunity will be given for visiting the buildings of the Concordia Seminary and others.

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Office of Miss Erna M. Barthel, Supreme Recorder, Royal Neighbors of America, in their new office building, Rock Island, Ill. Showing the "CLEMCO" Da Vinci Suite. "CLEMCO" Representatives: Fidler & Chambers, Davenport, Ia. Architects: Pond & Pond, Martin & Lloyd, General Contractors: Peterson & Colwell, Inc., Minneapolis.

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NOVEMBER 1929

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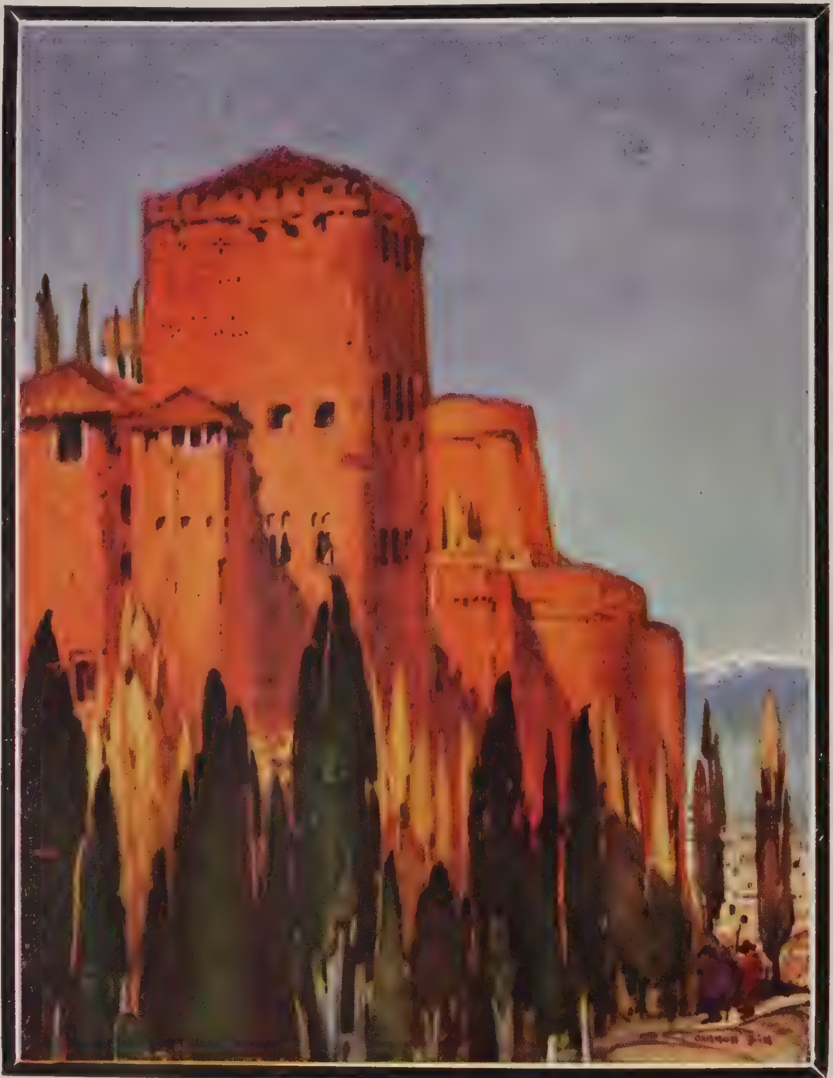

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THE ALHAMBRA, GRANADA
From a Water Color by Carroll Bill

THE
ARCHITECTURAL
FORUM
VOLUME LI NUMBER FIVE
NOVEMBER 1929

A SPANISH HOLIDAY—I

BY

CARROLL BILL

ILLUSTRATED FROM WATER COLOR PAINTINGS BY THE AUTHOR

WHEN I told the editor of THE ARCHITECTURAL FORUM that I was sailing for Spain to see all I could, to paint what I could, likewise to eat and drink whatever came my fortunate way, in short to bring back in portable form as much Spanish atmosphere as could be absorbed in a short stay, he, without knowing what he was letting himself in for, said: "Write me a story about it, so you can go again," and falling readily for such allurement, I here presume to set forth a few of my richly jumbled impressions, architectural and otherwise, of a country at once so ancient and yet so modern; so grim, and then before you realize it, so amiable and smiling; so replete with the mellow architecture of many generations of men and her people, so much a part of and so closely allied to her soil, that one feels the sense of relationship between a wrinkled, old, rusty-cloaked peasant and the brown church against which he leans in the sun,—brothers, in fact, and inseparable. That is something of Spain. Espana, land of romantic story, land of strange contrasts, land of rugged form and color and fulfilling all else that we have heard so many times before; then add—a country now darkly gloomy with rock-rimmed desolate plains, fantastic architectural groups piled up against a background of great, high-tumbled cloud masses, drab and slate-colored, and now smiling in her spring green of newly growing fields and the gray of ancient olives, with far-flung reaches of burnt orange earth against snow-capped, cobalt mountains, her great open spaces dotted here and there with the red-brown huddle of a town gathering in about the base of its protecting church tower,—that again is Spain.

To so generously expose glimpses of her great storehouse of art and architecture that the ordinary traveler may with little trouble see and enjoy them, and then to shut away in a hidden corner some treasure of a town the discovery of which so well repays any hardship and adventure of the less frequented roads and uncertainties of Spanish travel by either train, auto or mule,—that too is Spain, and the numbering of her delightfully feminine inconsistencies might be continued indefinitely, to the exclusion of all else were not the main object of these pages to add a bit to the already ample store of Spanish architectural tradition and picturesqueness. And so to the road, which in this particular case began in New York harbor, for, under the red and yellow ensign of the Spanish Royal Mail Line, one steps immediately into the atmosphere of Spain, and after one derisive gesture in the general direction of our Statue of Liberty we went below to feast on *arroz Valencia*, fried devil fish, and the pleasant vintages of the country, both red and white. Ah, voyage of delightful memory and picturesque incident!—the stewards, like old family servants; the rippling Castilian speech in general use; the little deck hands, never without cigarettes, but polishing brass and stoning planks till the vessel shone like a yacht; the opening of what appeared to be a pair of bookcase doors to reveal a completely vested little altar served by the ship's *chapelin;* the 30 or more religious refugees from Mexico, taken on by the kindhearted captain and given five meals a day, of which they took unfailing advantage; the retired American sea captain and his wife, on their way to a new home in Spain, and many Spanish commercial men, all interesting, the whole being much in the way of a good little appetizer for the rich banquet all laid and awaiting our landing.

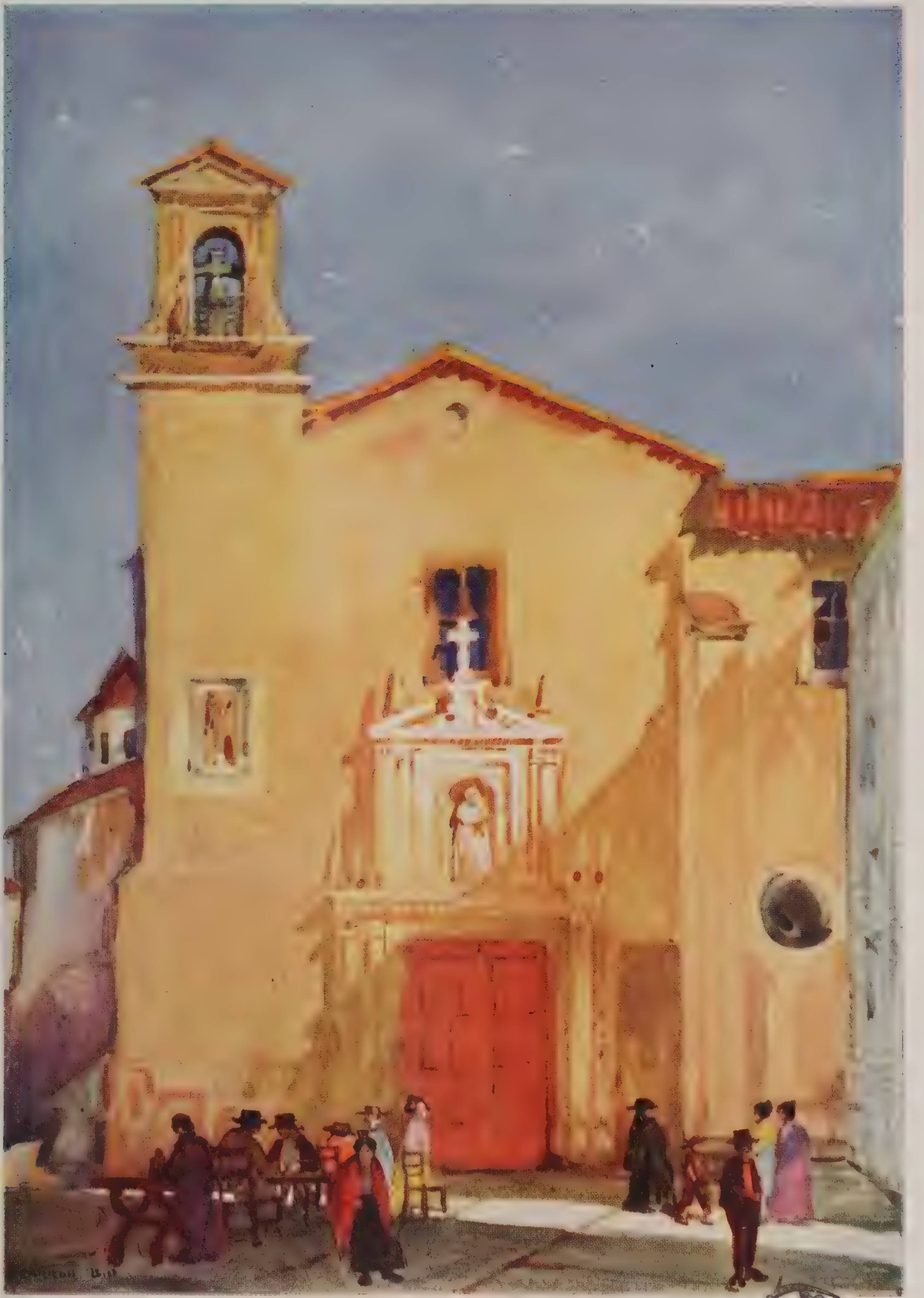
After bucking head winds, high seas and rain for 14 days, the far-away sparkle of Cape St. Vincent and the Portuguese coast line told us that the voyage was nearly over; and as the misty rainy morning gave sight of blue and white Cadiz, the sun cracked the dull sky open, and we entered Spain under the arch of a magnificent rainbow, theatrical, perhaps, but true and typical of many happenings in store for us. Cadiz held us no longer than was necessary to establish liaison with the Spanish railway system and its very convenient form of kilometer tickets, and nightfall found us snugly housed in Jerez, an hour's run from the seacoast that we were not to see again for a month. To give it its full-sounding, sonorous title, which I like very much, Jerez de la Frontera is a bright, cheerful town, prosperous to an unusual degree, thanks to its wine industry, about which, more later.

On arriving in any town, large or small, the established plan of procedure is to first find lodgings, bargain with the innkeeper, throw baggage inside the door, and then work out the shortest way to the cathedral. This plan is uniformly successful in establishing not only the location of the center of interest, which is almost always the cathedral, but also the general layout of the town, and in a short time it enabled me to acquire a good working knowledge of Jerez, aided, it is acknowledged, by an antiquated Baedeker of the year 1901. But Spain had changed so little that the old plans of streets and buildings were little altered from my memory of a previous trip, 15 years earlier. Jerez has the usual generous number of churches of a Spanish town, all interesting because all so different, and covering a span of several architectural periods. The best remembered are San Dionisio, a Gothic-Mudejar structure with great blank, grim walls and with a rose window at the very peak of its gable; the Colegiata, a Baroque edifice, with its towered facade and wide-flung buttresses, a curious combination of Gothic and Renaissance, approached by an intricate arrangement of ramping stairs; on each of the yellow stone finials of its lofty front was perched a black and white stork, whose ragged feathers blew in the wind, for all the world like the hair and beards of old men; San Miguel, with its handsome blue, white and yellow tiled tower, and San Francisco, yellow as gold in the afternoon light; and, planting myself in artistic rather than religious adoration, I began my first Spanish sketch.

The original intention as to painting was to make finished water colors on the spot, but my initial experience in Jerez changed all that, and I had been at work but a scant five minutes when I was surrounded by a crowd of perhaps a hundred spectators, not malicious or troublesome, but so childishly curious and eager to see what the folding stool and trick easel and little tubes of color were all about and what sort of entertainment I was to provide for them, that they made impossible anything but the most impressionistic handling of the subject. Speaking, as I did, a little Spanish, it was possible to hold them within reasonable bounds; but my wife, good companion on my journeys, also sketching and by nature conversationally adept, was, in this emergency, reduced to the silent acceptance of all that the crowding onlookers chose to offer and was, on one occasion in Jerez, politely but firmly escorted to the nearest police station for blocking traffic.

Architecturally, and paradoxically speaking, the chief item of interest is not in Jerez at all but three kilometers away over the dusty road to the southeast, where in its mellow and deserted isolation lies the Cartuja, a Carthusian convent founded in 1477. The first impression is of a great and elaborate Renaissance facade completely isolated from the rest of the group of buildings, a huge towering gateway, in fact, through which we pass into a stone-paved, grass-grown court, once the nave, but now open to the sky with side walls tumbled to heaps of rubbish. At its far end is another facade of the same yellow stone with coupled columns piling up to support and enframe figure-filled niches and broken cornices, all soaring to a central composition of rose window, arch and crowning structure, and the whole profile enlivened by curious and elaborate urn-shaped pinnacles and balustrades. Keeping in mind this last word in late Renaissance, we thread a series of passages and courts into one of the largest and finest Gothic cloisters in Spain. This architectural contrast or association of two or more distinctly different styles is to be met constantly throughout the land, and strangely enough it is not as disturbing as it might seem, for the Renaissance has a Spanish flavor all its own, as has also the Gothic, and the two seem to dwell in intimacy peaceably enough. Picture to yourself a great cloister, 500 feet square, completely arcaded and buttressed, with its upper structure housing in its high day a thousand monks; in the center a stone basin, in which might swim a dozen swans, with a fountain in the middle of the pool, and above all the lofty yellow mass of the main church showing through the black-green of ancient cypress. While in a lamentable state of neglect and ruin, it was a joy to learn that the Cartuja had been taken over as a national monument, and in one corner a tiny group of human ants had already started their mighty task of restoration. Perhaps because it was our first important architectural discovery after landing in Spain, and because we came so unexpectedly across such a tremendous pile of yellow sculptured stone in its sleepy isolation, the Cartuja made a mental impression that endured throughout all our sojourn in the country.

And now, speaking not at all in reference to architecture, the most delectable phase of life in Jerez centers about a certain time-honored and traditional industry which owes its existence to the enormous vineyards surrounding the town on every side and through which the road leads back from the Cartuja. Now be it known that from these same vineyards, made up of what as far as I could see were acres of dry dust, stuck all over at regular intervals with gnarled stumps and most



From a Water Color by Carroll Bill

CHURCH OF SAN FRANCISCO, JEREZ DE LA FRONTERA

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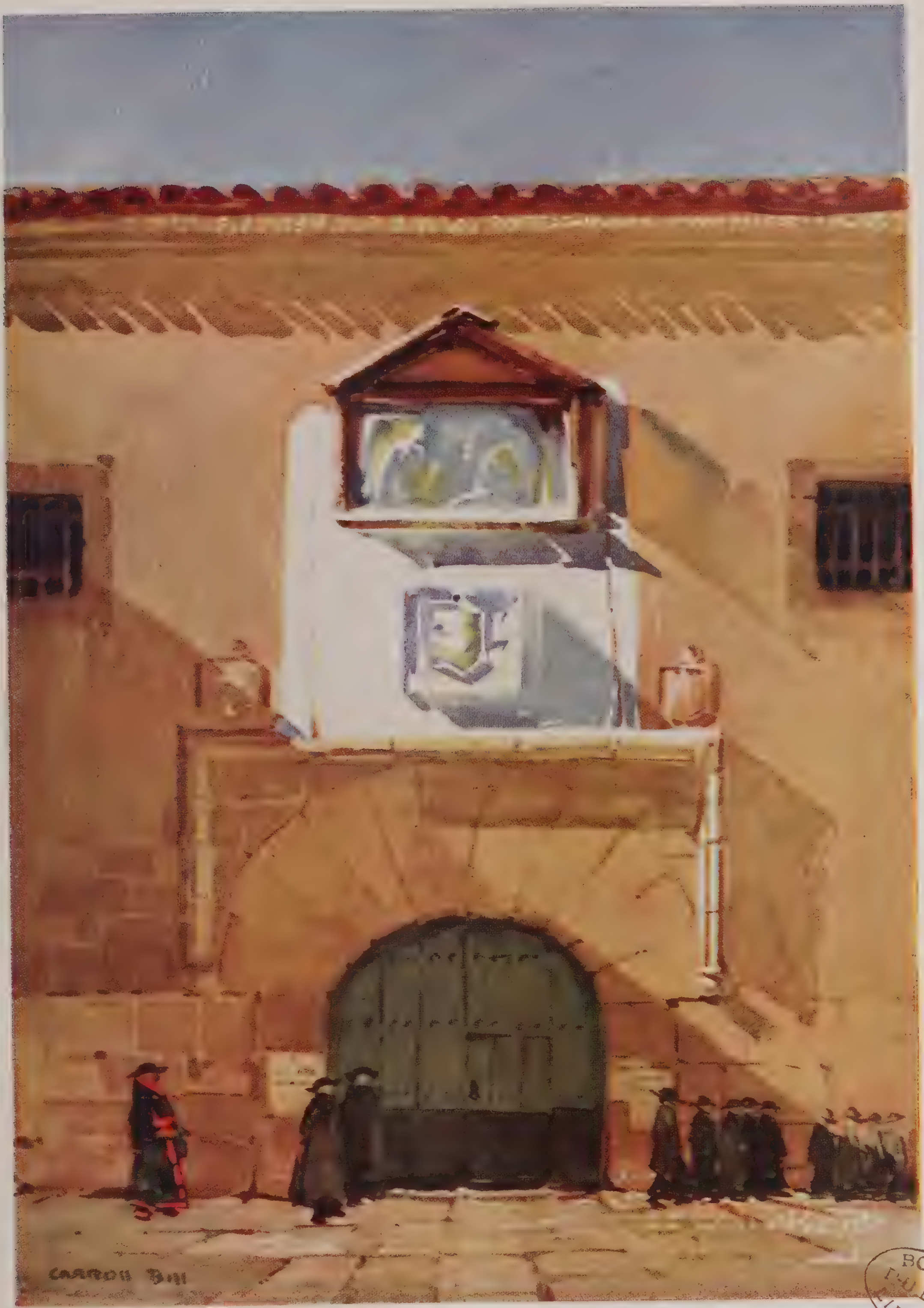

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CONVENT OUTSIDE THE WALLS, AVILA

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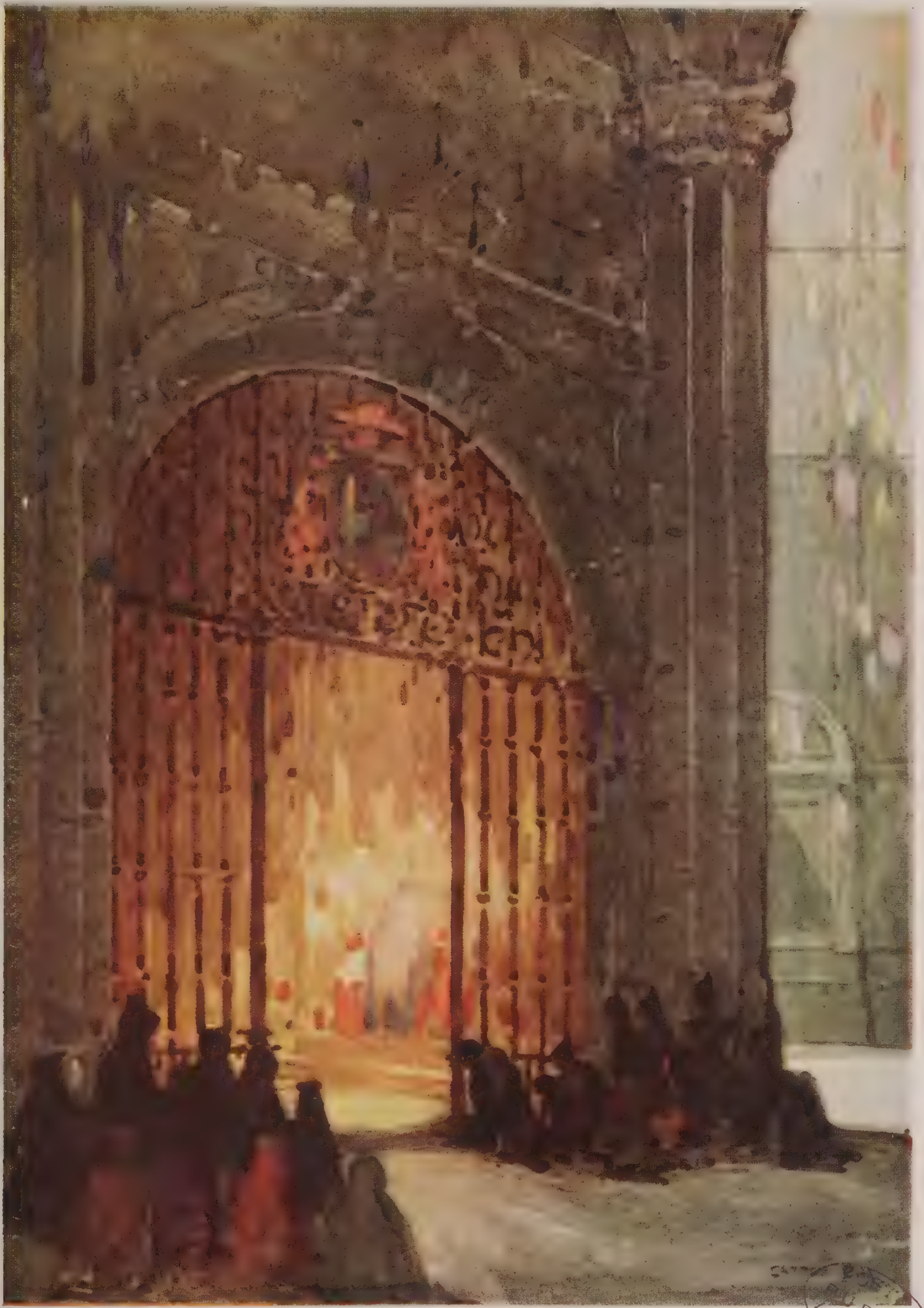

From a Water Color by Carroll Bill

CHAPEL IN CATHEDRAL, SEVILLE

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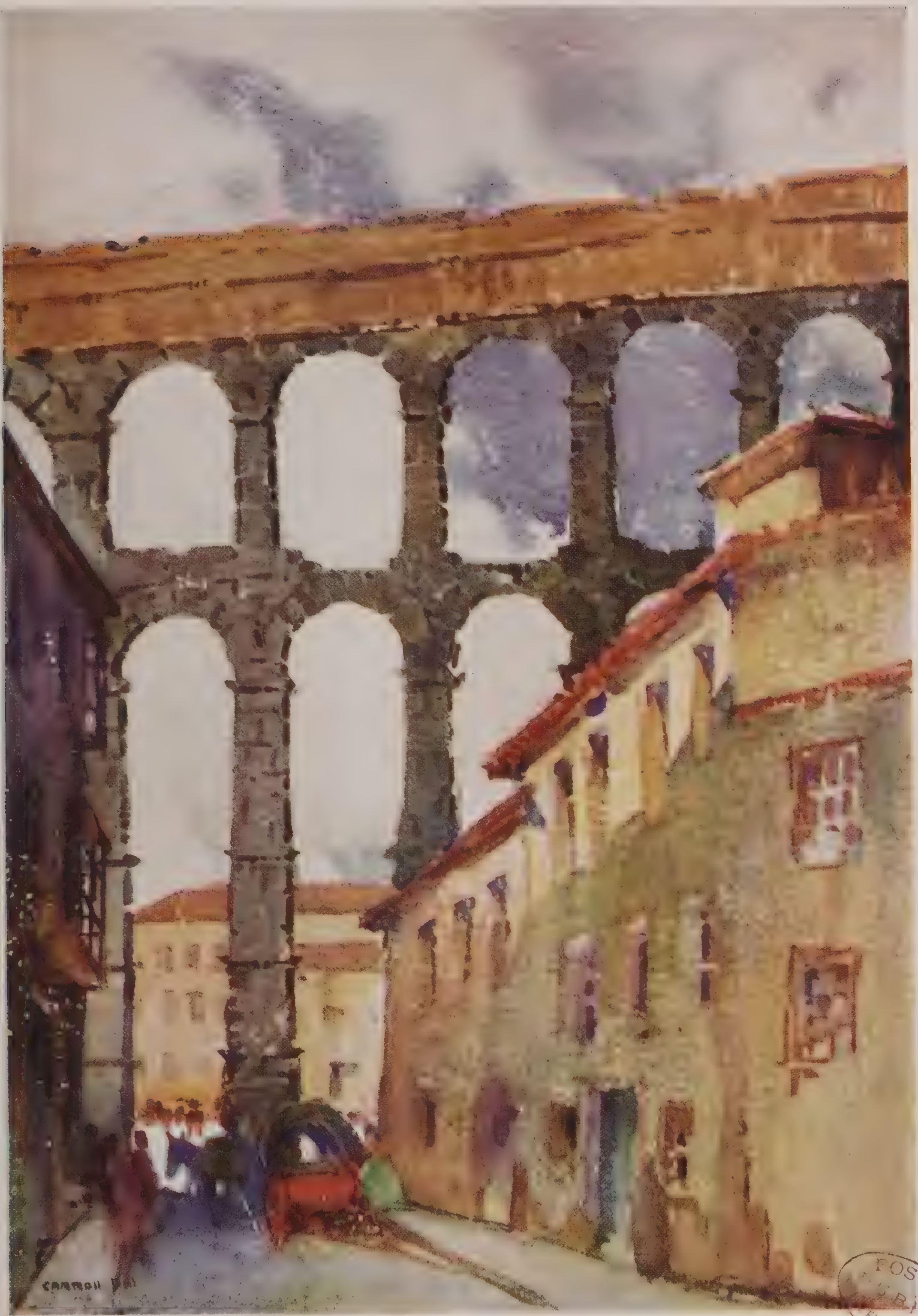

From a Water Color by Carroll Bill

THE ROMAN AQUEDUCT, SEGOVIA

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unpromising looking twigs from each of which had been trimmed all signs of life save one solitary green sprout, there ripen in due season the grapes from which for generations of men have been gathered, nursed, educated and matured the luscious vintages known to the civilized world as sherry. Shakespeare's England knew it, and old Falstaff tells of "sherris sack from whence comes valor," and down through Georgian times every sporting baronet let no year pass without having his casks built one within another to prevent theft of the precious contents coming over the channel from Cadiz harbor, and no cellar worthy of the name was without its butt of Oloroso. My emotions, olfactory, gustatory and spiritual, were raised to their highest when invited to visit the great *bodegas* of Pedro Domecq in Jerez. It was an invitation easy of acceptance, and after being shown through warehouses and storesheds, cathedral-high in size, piled ten deep with casks in various stages of development and whose removal from their fragrant surroundings is permitted only after 30 years of faithful attendance, we were reverently conducted and ceremoniously introduced to certain mouldy tuns, some of which had reached the serviceable age of 200 years and bore the arms of George III, William Pitt, the Duke of Wellington and the like, and were invited to sample their fragrant contents. The present royal house of Spain was represented, and Alphonso and his queen had their casks gaily hung with the colors in recognition of a recent visit. The ultimate hospitality of this fine establishment, as extended to us by its gracious younger son, took the form of a parting gift of two bottles of the famous Oloroso, dated 1840!

Fearing that, after such a soul-satisfying experience, which comes to the ordinary mortal but once in a lifetime, but which I cherish hopes of repeating within the year, any other possibility of Jerez would prove but an anticlimax, we took the road to Seville and in a murky drizzle, not at all typical of southern Spain, we clattered over stone pavements and around amazing corners in search of a certain sixteenth century palace, now in this later and more prosaic day devoted to the sheltering of just such travel-worn and none too particular seekers of the picturesque as were then knocking at its battered portal. Bowed in by the whiskered Don Marcos, we were shown a room on the ground floor which must in the early days have been a lounging place for the menials of the house and in which were four doubtful looking beds and a damp chill for a coverlet. Protests finally availed, and crossing a great patio open to the sky and up a staircase 15 feet wide, we were very pleasantly lodged in an enormously high-ceilinged room with great wooden window shutters, tile floor and two electric lights, only one of which could be lighted at one time, a thrifty bit of electric wiring that, with experience, was found to be universal throughout Spain.

Seville, always smiling, but now wearing an air of newly acquired prosperity, had taken to herself a different and rather disturbing atmosphere. Always gay and very feminine, she had blossomed out in a dozen different ways,—old streets pulled apart; new streets cut through, with smart-looking shops with Frenchy looking clothes in their windows; a traffic problem all her own, due to the crush of automobiles, mostly American, from those of a well known make up to luxurious limousines; all this rather unpleasant on the whole, until we put ourselves in a state of mind to accept all this modernity as a foil to emphasize the dignity of the archbishop's palace, the sparkling stateliness of the *Ayuntamiento,* and the fine soaring shaft of the *Giralda,* lifting its aristocratic self far above the modern tangle in the streets at its feet. To me Seville is personified in its cathedral. In contrast to the masculine vigor of the cathedrals of northern Spain it has a lightness, an almost feminine gaiety in its tangle of pinnacles and buttresses. There is no facade, as such, but a great wall seeming to enclose the church and opening out on one side to make room for the cheerful Court of Oranges with its fountain, where come the women for water. All this so disguises the plan that one can form no definite conception of the interior arrangement, and it is only when one enters that there comes the full realization of the wonder and immensity that man has here created. I hope that the visitor will have his first impression as did I, late in the afternoon, when the sun had left the lower church in mellow gloom with here and there a candle-lighted chapel glowing in the dusk and the intricate detail of the high altar and its soaring *retablo* catching the light from the amethyst, ruby and orange glass of the clerestory windows. I am not attempting any detailed description of Seville or any other cathedral. One can, if one wishes, find it handled by many different minds from many different viewpoints,—John Lomas, for instance, Maud Howe, or even that emotional Italian, Edmundo de Amicis, who confesses that he cannot even think of Seville Cathedral without his throat swelling to dangerous proportions, and so to avoid any such calamity, I am risking the wrath of most lovers of Spain by claiming that the Alcazar of Seville can give all and more of Arab detail, color and feeling than can the much-vaunted Alhambra at Granada.

Perhaps I am prejudiced against Granada by painful recollections of the nine-hour railroad journey, the sordid modern lower town, the failure to find lodgings in the pleasant place where I had lived 15 years ago, and the whitewashed, dusted-up interior of the Arab palace itself, and the reader must pardon this, my one and only period of disappointment of the whole trip. And even the Granada detour had its bright spots, for from the train there passed in stately review the lofty ranges of the Sierra Nevada, its gray-green foothills banded with raw red earth, warm purple slopes and ultramarine peaks snowcapped against a tumble of white clouds, and the great red Alhambra and the little *Generaliffe* snuggled in cypress groves and ilex thickets; all charming, but to repeat, one might well remain in Seville and enjoy at the Alcazar a feast of beautiful arches, walls patterned with marvelous tiles, mosaics and sculpture, fountain courts and gorgeous colored and gilded ceilings; and further controversy as to the comparative superiority of the Arab remains of Seville and Granada may best be avoided by walking out on the bridge of Triana, and if it be at the end of the day, the passing crowd is as entertaining and colorful as a well staged play, set against the background of the Guadalquivir with its shipping and docks.

The patient oxen, single or paired, with red wool headgear hanging over their eyes, draw enormous loads with a slow, heaving lurch, and little gray donkeys with big frowsy heads look out from under burdens so out of scale with the small beasts as to suggest huge piles of fagots trotting along on very diminutive legs. Abused and overloaded as the Spanish donkey seems to be, it was finally decided that he was not to be pitied so much after all, for he is the absolute personification of utter resignation to fate, and one typical case of kindness was when a small brown donkey was slowly fed a long hot dough fritter by the master who towered well over the small back on which he had been riding for many miles. And what an amazing variety of articles are piled on these little beasts! Great bags of clay going to the potters to be spun on the wheels that have been turning for three centuries, and to return in the form of water jars, great basins and the rest of the pottery that has made Triana famous even outside of Spain; huge tin water cans polished to the gray luster of pewter; piles of olive branches destined for the charcoal burners rather than the proverbial peacemakers; odd pieces of furniture; white meal sacks; the colorful *alforjas* or saddle bags; and as often as not a human burden, lounging cross saddle or with legs dangling to the ground, smoking the usual cigarette, and both beast and rider ambling along totally indifferent to the rest of the traffic. And if we stay a bit longer on the bridge, we will see groups of cigarette girls home bound from the tobacco factory; brown cloaked, red capped soldiers back from the Riff war; a bearded Franciscan; a *guapo* or bravo with colored sash and broad-brimmed hat; and his traditional enemy, the *guardia civale,* brave in his gray and yellow tunic and shiny black headgear.

As far as limited time and the chances of the road permitted, it was our intention to see something of the smaller and less frequented towns, and the first step away was to Utrera, a jolly little place an hour's run from Seville. If our reception by the inhabitants was any indication, we must have been the first of our kind to invade its steep and narrow streets. The opening of a camera was enough to block traffic, and our progress was one long procession in which we were the distinguished leaders; it was only by finally ducking through a doorway and shutting the gate that we rid ourselves of our followers and took possession of a very lovely garden, where we were made welcome by its gracious owner. We sat under the flowering lemon trees and sketched, first the great square tower of Santa Maria de la Mesa, and then the beautiful plaster structure over the well in the center of the garden, and we would have been content to spend there the rest of the day but for the lure of further adventure.

The Spanish children who are so much in evidence in these informal gatherings are for the most part happy, pretty little people and enjoyable enough except when they cough down your neck in their eagerness to see your sketch. I never found them malicious, but just bubbling with an easily understood curiosity, and I recall with delight being accompanied by a dozen little boys and girls all, to be sure, spurred on by the hope of a copper reward, uphill and down on a long tramp outside Granada; and when I at last reached my objective and reclined in the shade of an ancient cypress, these little imps, none of them over ten years old, did for me on impulse a wild dance with wriggles, twists, snapping of fingers and all the grown-up mannerisms of the gypsy tradition.

If for no other reason, I place Utrera well in the fore of Spanish towns on account of its cleanliness. Whether this unusual condition were due to the heavy spring rains (of which in a 40-day stay we had 17), or to the industry of its people, it matters not; but white it was, bright and sparkling, and with its main square closed in with snowy house fronts, whose many balconies held pots of scarlet flowers, it was a joy. Not that cleanliness or the lack of it makes one particle of difference to me when weighed in the balance with picturesqueness, and I have no patience with the returned tourist whose only comment on some charming old town is that his sensitive nose was assailed by aggressive odors and that his eyes were forced to view unpleasant sights, which entirely overpowered his appreciation of the often surprising beauties of the place!

THE SPIRIT OF MODERN ART

BY

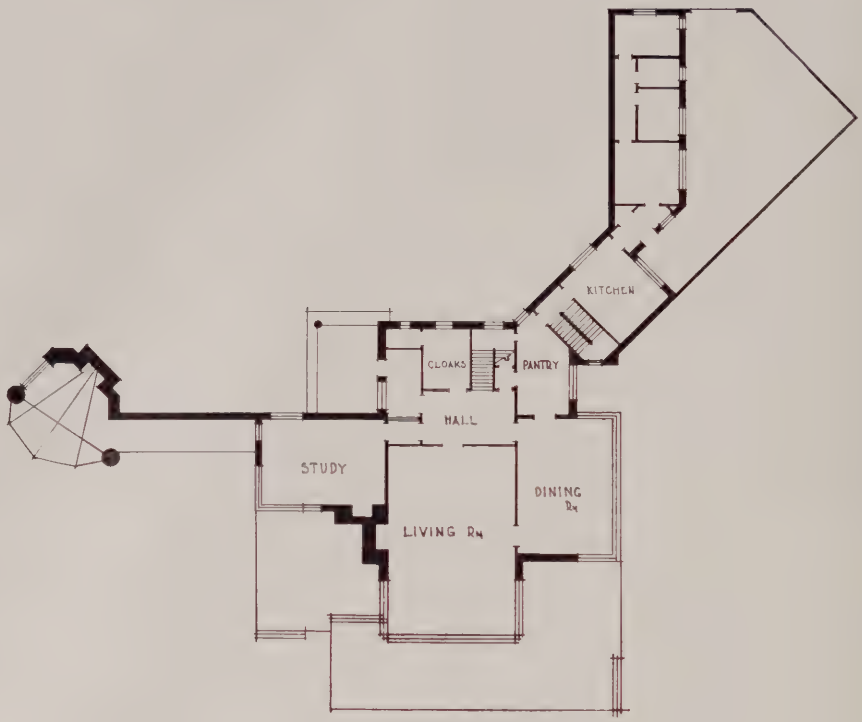
RAYMOND M. HOOD

THERE is no need to tell anyone that art has "gone modern," but very few people know what "going modern" really means. The common conception is that it means a radical change in the looks of things, that the time has arrived when precedent and the accepted standards of beauty are all to be thrown overboard, and that with a new philosophy as a base, new standards and wholly new conceptions of beauty are to be manufactured. Nothing could be further from the truth. The modern movement does not concern itself with looks at all. It does not care whether we abandon or follow precedent, nor is it interested as to whether the new rules of art are derived from the machine, nor even whether there are to be any rules at all. This misconception is the result of the shallow propaganda of the art critics and the dilettante magazines, as well as because of the stupid exploitation by those who traffic in art. For there is in the new movement such a value, both as news and otherwise, that nobody in the business of exploiting art has made any attempt to dig beneath the surface to find out what modern art really is. They have merely dished out what they found on top, made a grand living out of it, and let it go at that.

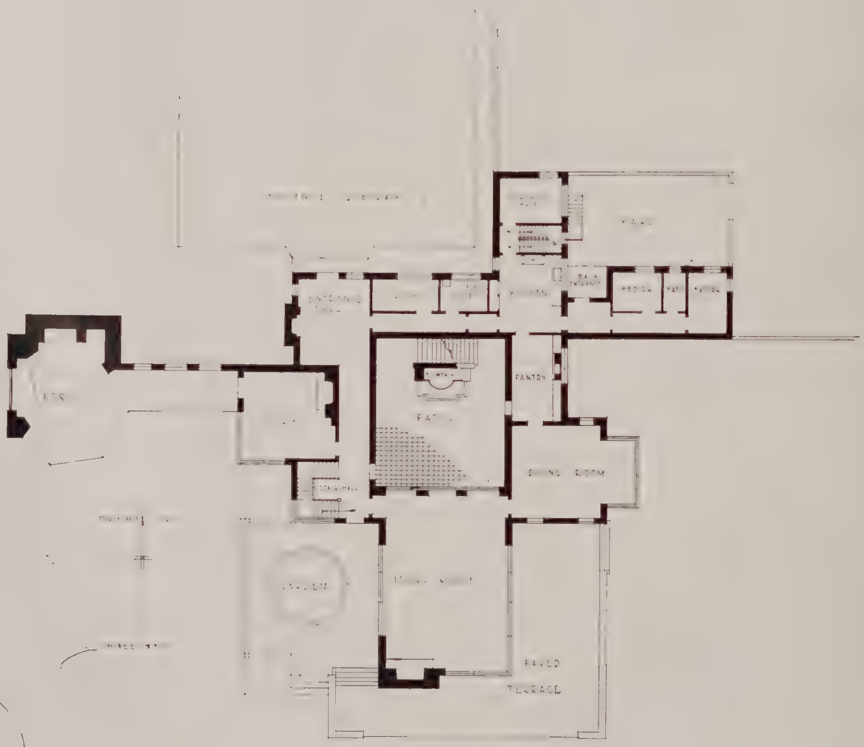
There is a general idea that after a certain length of time a style of art must be changed, merely because it has become monotonous, and because people tire of one aspect of things. Minor changes and fashions of the moment may be explained that way, but the reason for great changes, such as the development of Greek or Gothic art, lies much deeper than that. And the movement that is going on today transcends in importance even movements of those epochs, great as they were. I doubt if a new era of art has ever developed where a desire for a change of appearance, or a change for the sake of a change, had less to do with it than is the case today. If anything, it is safe to say that people had never been more content with the looks of things than they were just prior to the time when the modern movement began to take form. Certainly the antique business bore witness to this fact. Patronizing art was a comfortable and easy pastime. The rules were well formulated, and with the authority of centuries behind them, they were generally accepted. Standards were so well established that beauty could be determined almost by rule of thumb, and a certified work of art had a value as sound as a government bond. There was nothing disconcerting in the business for either the artist, the merchant or the buyer. Everybody was happy as far as looks and beauty were concerned, yet it was at this very time when art and beauty were so comfortably organized, so apparently secure in their hold on the imagination of people, that the modern movement began to force itself upon us.

The truth is that, way down deep, art was really in a bad way. For centuries the romantic sentimentalist and the artistic genius, with his capacity for giving infinite pain, had been in the saddle. They held a tight rein, and their authority was bolstered up by everything that was called culture and tradition. Art had become a smug, fashionable game in which the world was the victim, for while the world paid the bill, the artist took nothing seriously save himself. He might be commissioned to create something to achieve a certain purpose, or to express a particular idea, but from his point of view the only purpose to be achieved was the perpetuation of his own brand of beauty, and the only thing to be expressed was his own soul. Creative work might be stimulated and paid for by others, but for him it was only an opportunity to express himself and his cult and to achieve immortality. Humbly doing the business that was set before him to do was not in his code of ethics. A timid remonstrance that a table was not suited to its purpose or that it was rickety, elicited a scornful reply that if this slight sacrifice could not be made to beauty, it would be better not to have a table at all. A person brave enough to insist on an article's being useful got in return a contemptuous toss of the head and was promptly put back in his place along with the other lowbrows. The public was bullied, browbeaten and buried beneath an avalanche of historical reminders about the Greeks, the Medici, and men of the other golden ages when people lived, suffered and died for beauty.

A mechanic would make a comfortable chair, and a designer would calmly ruin it in the interest of art. A railroad company would try to build a station, and its architect would blandly set aside one after another of the practical elements that had been worked out, because they prevented his developing in the building his theory of composition and beauty. The chair designer would not permit the chair manufacturer to make a good chair, neither would the architect permit the railroad company to build a good station. The mentality of the designer, at times, was so far twisted that the chair must be built to satisfy Mr. Hepplewhite, and the station Tiberius Cæsar, in spite of the fact that both have been dead for a long while, and neither of them would either pay for or use



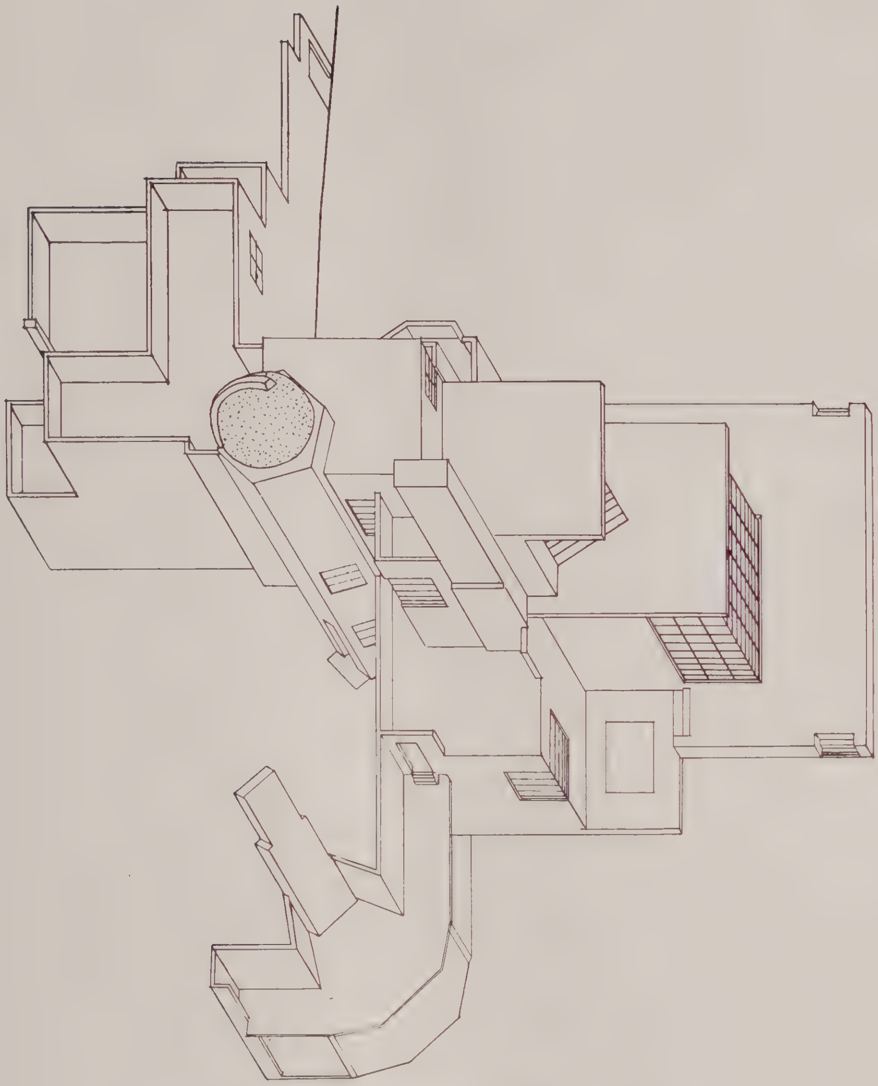
SCHEME W



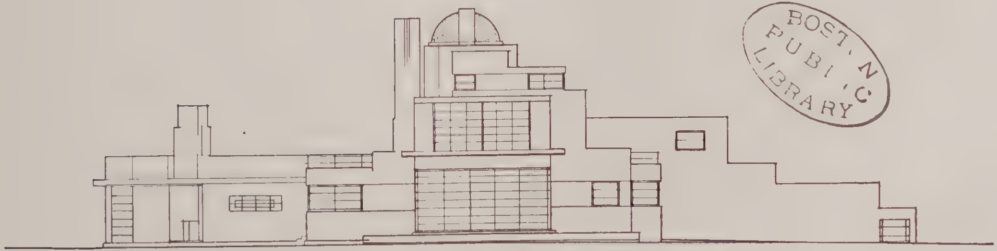
SCHEME X

TWO PLANS FOR A MODERN HOUSE

JOHN M. HOWELLS AND RAYMOND M. HOOD, ARCHITECTS



BIRD'S-EYE PERSPECTIVE, SCHEME W



SOUTH ELEVATION OF SCHEME W

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DESIGN FOR A MODERN HOUSE
JOHN M. HOWELLS AND RAYMOND M. HOOD, ARCHITECTS

the object that had been designed to suit him.

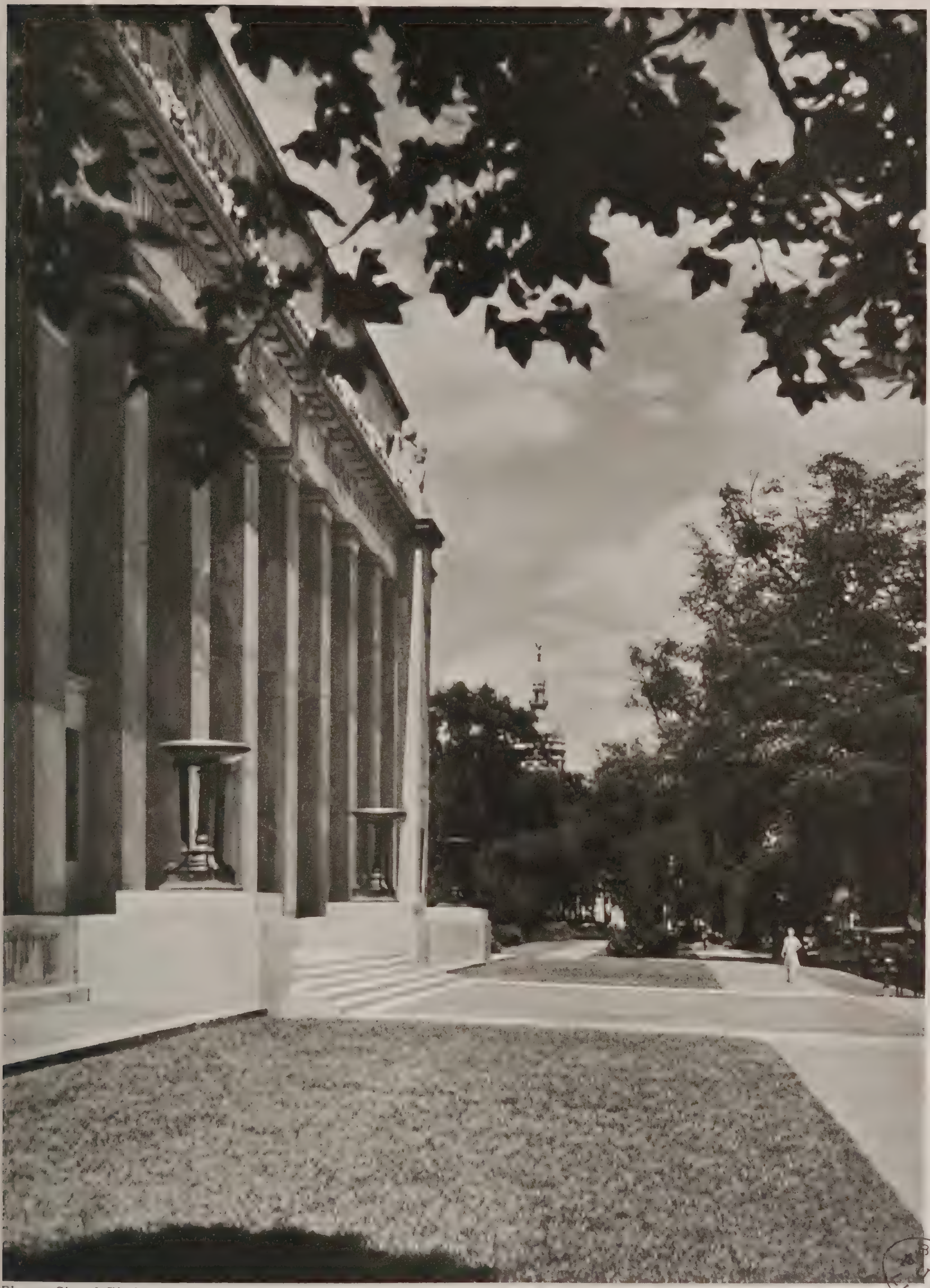
To take an example from my own profession, the architect might tell you that the symmetry, the balance of a composition, or the character of the exterior would prevent your having a room of the size and character you required. He might even prevent your putting windows and doors in the places they should go for the comfort of living, for similar æsthetic reasons. In fact, art had become a hard master, and yet in spite of its pretentiousness, it was really shallow. It concerned itself only with externals,—how it impressed people,—and it paid little heed to what went on underneath. It was like a man who insists on being perfectly dressed and on having perfect manners, but who pays no attention to his character.

It is against this despotic sway that modern art has risen in revolt, and it is not because the old rules of composition, color harmony, unity and so on must go by the board. The artist or critic who tells you that tempo, rhythm, dynamic symmetry, color discordance, motion, pattern, or the inspiration of the machine are the basic qualities of the new art, is passing out the same old hypocrisies that the new art is trying to overcome. These qualities may occur in modern art, but they are incidental and not essential to it. Modern art involves a sincere attempt to be honest. If a man asks for a fork, he isn't offered a spoon. If he wants a work bench, he isn't given an Italian altar piece. If the glare of a light hurts his eyes, he is not told that his eyes are wrong; the fixture is re-designed. A door is a door; something to walk through, something to open and shut, not a recall of a dominant motif in a facade, nor the expression of some æsthetic emotion. And the same spirit, the same effort, is the basis of all modern design, from that of the pen holder up to that of the great skyscraper. We try to be honest and give a man, his ideas and his money an even break.

To put the case briefly, the modernist is trying to "debunk" art. He reverses the common philosophy of the past centuries, when the manner of doing a thing. its form and appearance had become more important than the thing itself, when the iron-clad rules of art and beauty came first and utility trailed along as best it could. Today utility leads the way, and although the result may not always send emotional shivers of beauty up the spine, it offers a good substitute in that it satisfies the intellect. The practical elements of a problem are solved before our old friends, — art and beauty,—are given a crack at it. So, if chromium is used in modern work, it is not because it is the fashionable metal of the new period, but because it is more practical, cleaner and requires less care than other metals in the same place. When plain surfaces and color decorations take the place of elaborately modeled forms and ornament, it is not because simplicity and color constitute the keynote of modern art, but because to produce the elaboration and ornament of the older styles required an effort and cost far out of all proportion to the importance of decoration, and because the article is more serviceable when done in a simpler fashion. That appearance of things has changed is inevitable, for in his search for truth and honesty, the designer of today must avail himself of every new material and process that is superior to the old. And in so doing, the inherent qualities in the new materials and processes that he uses force a new external expression.

I need hardly point out that the new movement has freed the spirit not only of the designer, but of the world at large. Art is no longer cloistered religion, shrouded in mystery in order to better keep up its authority. We do not have to stand in awe of it lest we be outcasts from the world of culture. We need not fear when we ask for bread that the artist will give us a stone. We ask for what we need and we get it,—and, strange to say, the artist now tells us that this is the only true path that leads to beauty—and that real beauty is only achieved when utility is the goal. For ages we have been searching frantically all over the world for the path to beauty, and now we have come to find that the path lay at our feet all the time, and that common sense and logic will keep us in it if we will only accept and use it.

I am far from saying that all the artists who have "gone modern" have turned away from the hypocrisy and cant of the periods gone by, and that those who haven't are still sunk in sin. Many who have adopted the external trappings, the color, decorations and details of modernism are far less modern than others whose work may still bear an external resemblance to that of older periods, but whose conception is fundamentally modern. In fact the same fellows who were hypocritical and dishonest in their art yesterday, are hypocritical and dishonest in their art today, no matter how they may be classified in the public mind. The sincere artists through all ages have worked as honestly as the sincere modernist is working today. The only difference is that now he can come out into the light, without fear, for at last he has the weight of opinion and culture at his back. The man in the saddle today is the artist who wants to help and not to clutter up the path of progress. The man who says "It can't be done, because it wouldn't be beautiful," is supplanted by the man who says "Of course it can be done." It is the beginning of a great era for the world, as well as for the worker in all fields of art.



Photos. Sigurd Fischer

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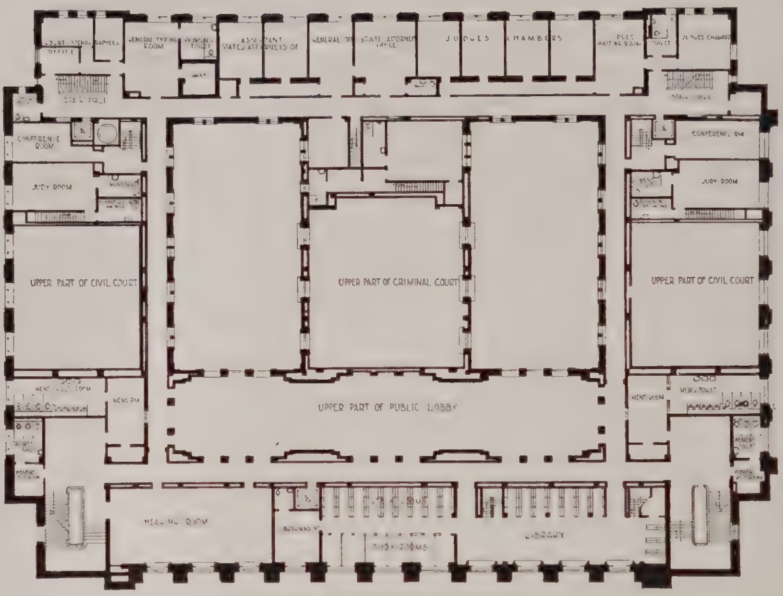
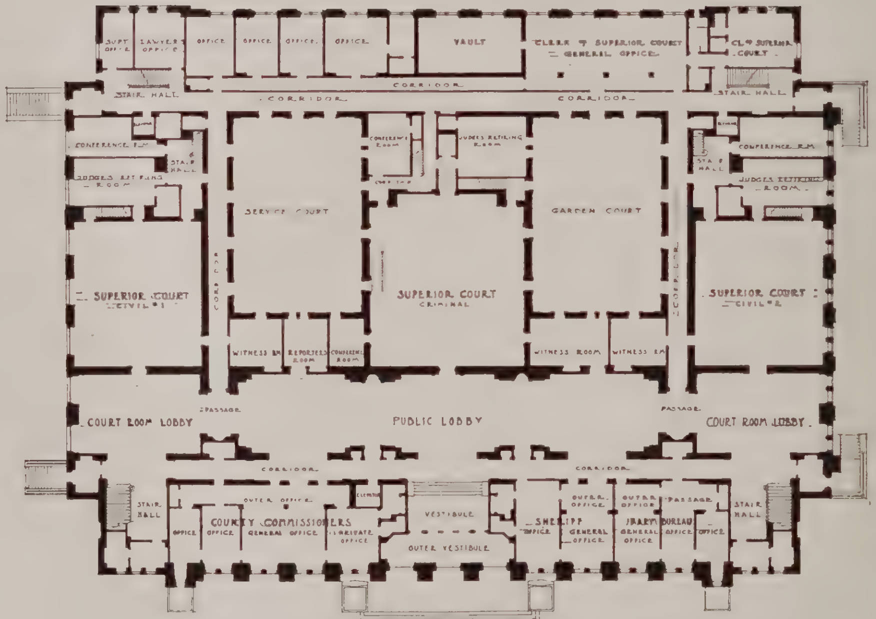


FIRST MEZZANINE FLOOR



FIRST FLOOR

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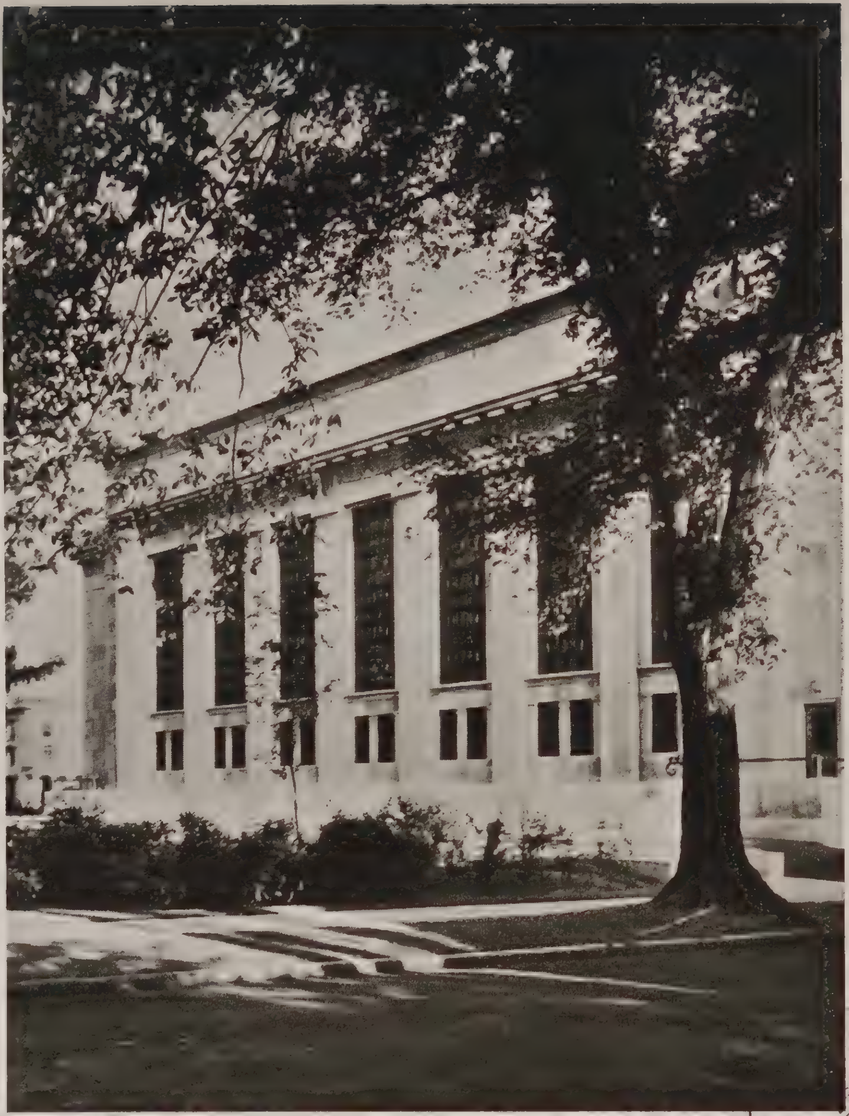
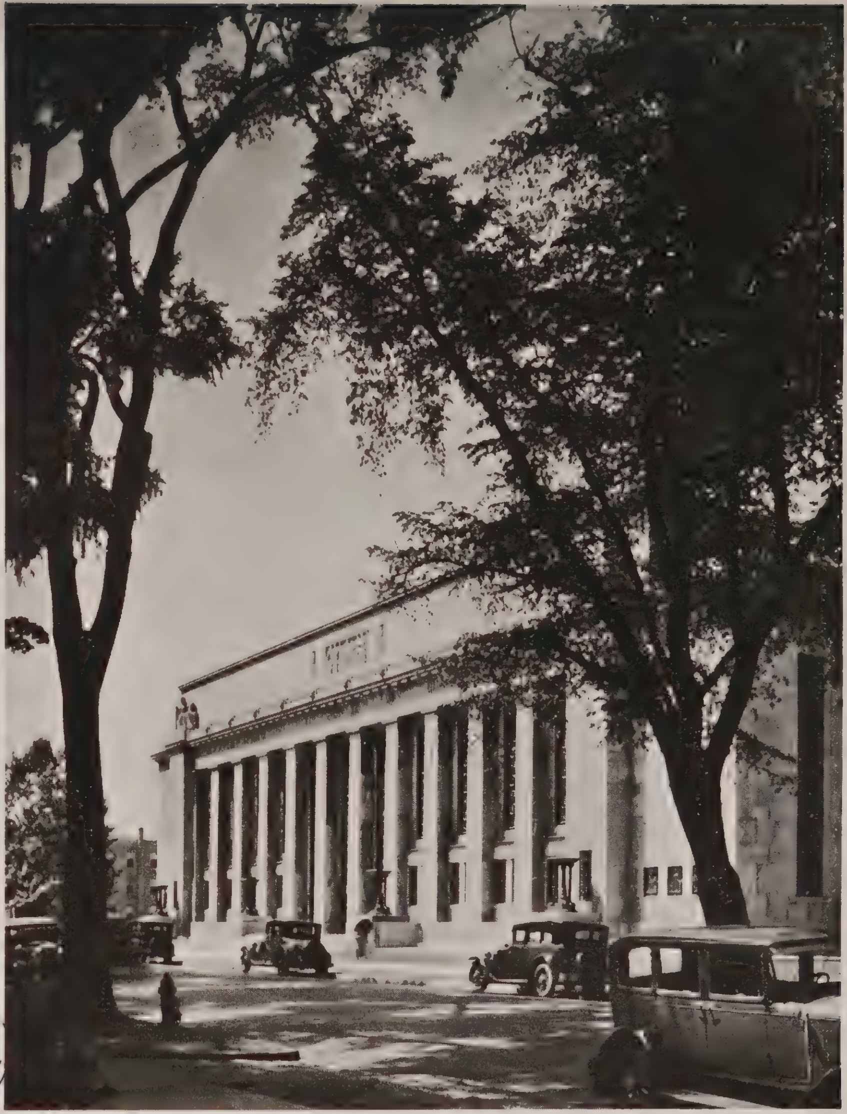


NORTH ELEVATION



Plans on Back

FRONT ELEVATION

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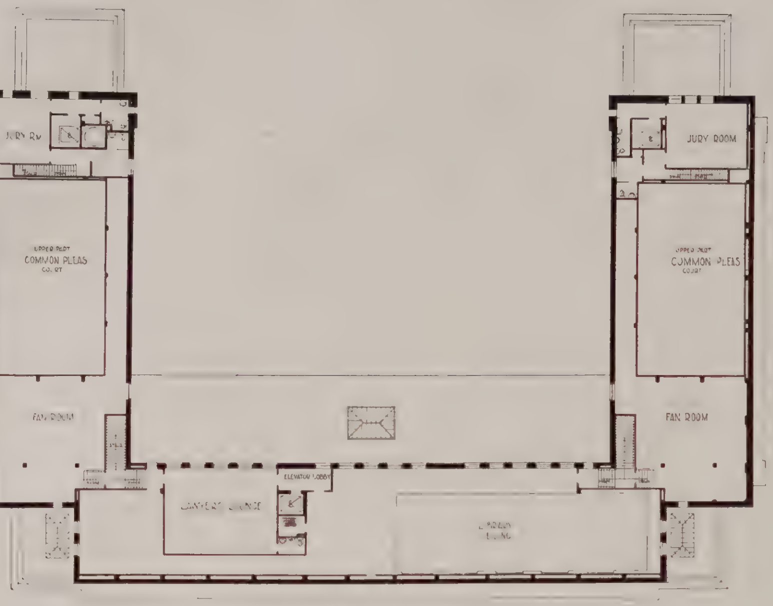
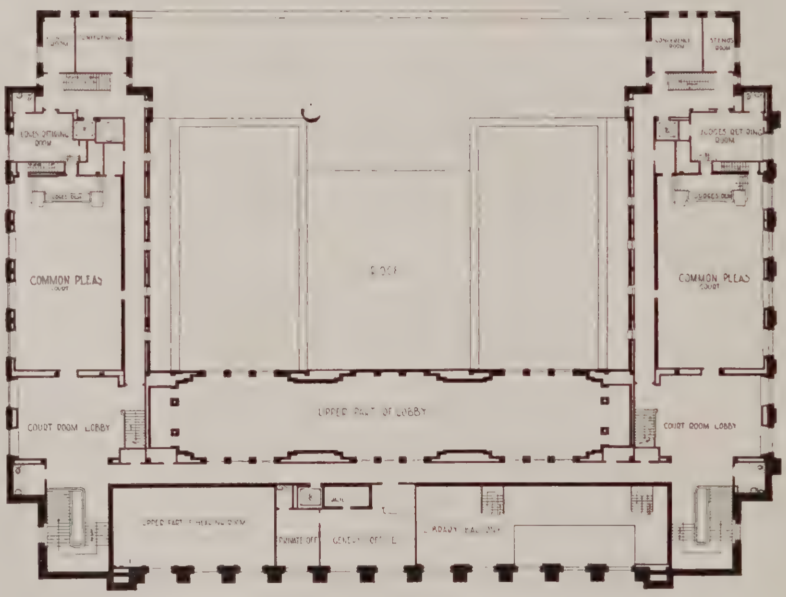


THIRD FLOOR



SECOND FLOOR

PLANS. HARTFORD COUNTY BUILDING, HARTFORD

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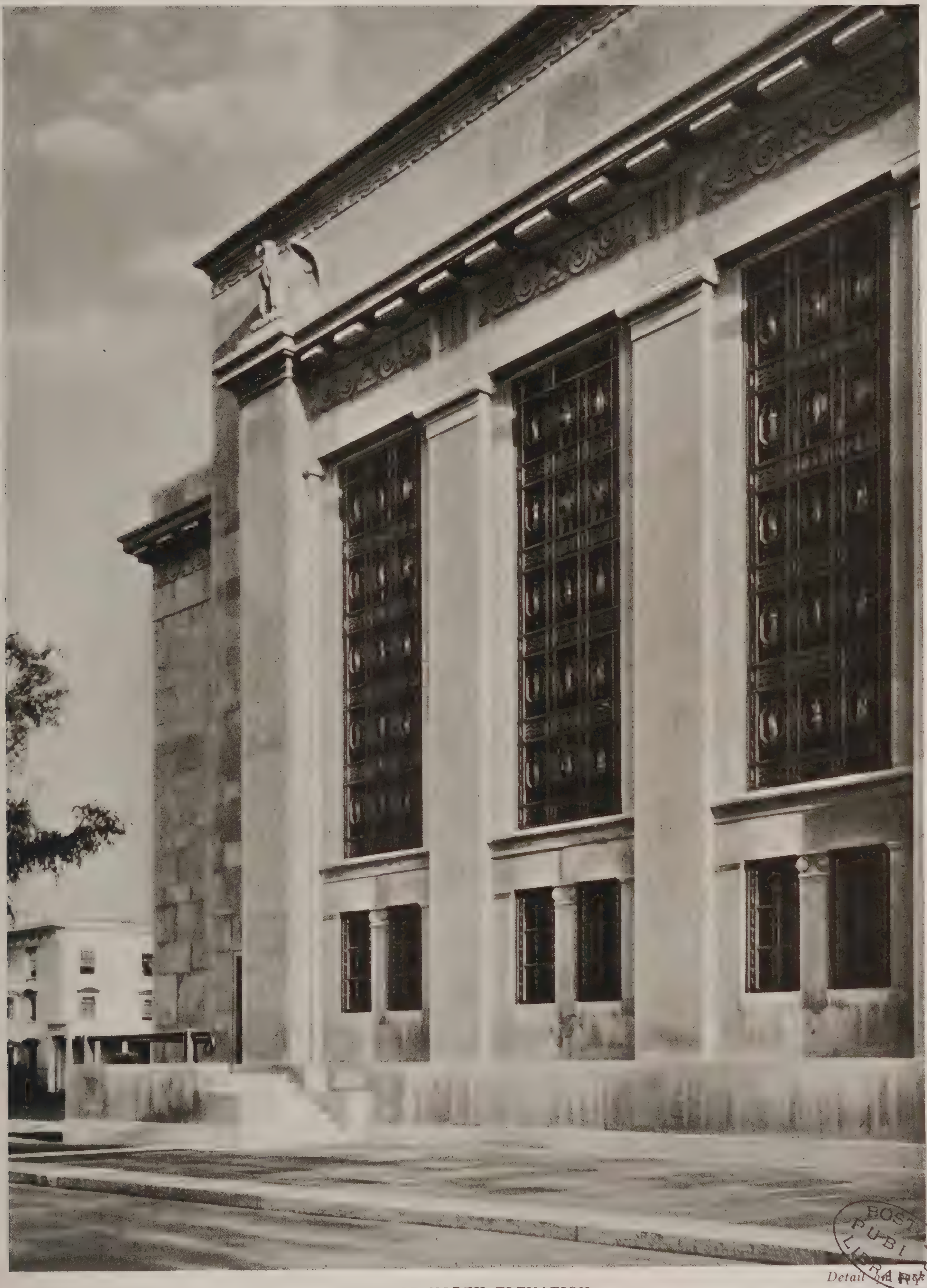

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PART OF NORTH ELEVATION
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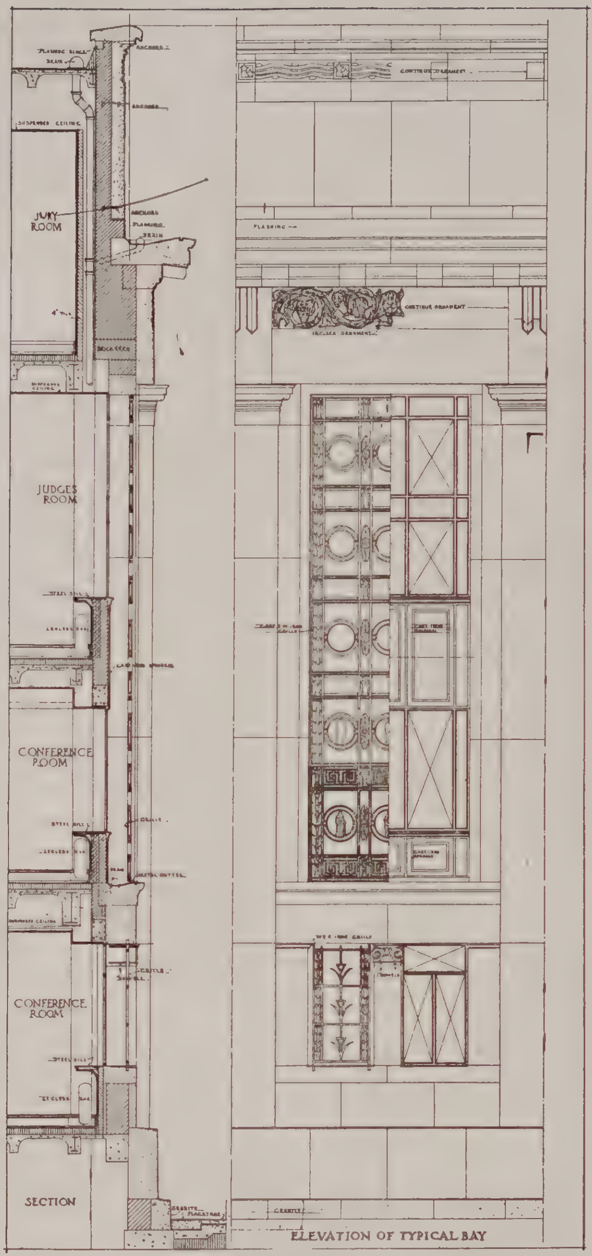

A TYPICAL BAY

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The ARCHITECTURAL FORUM DETAILS

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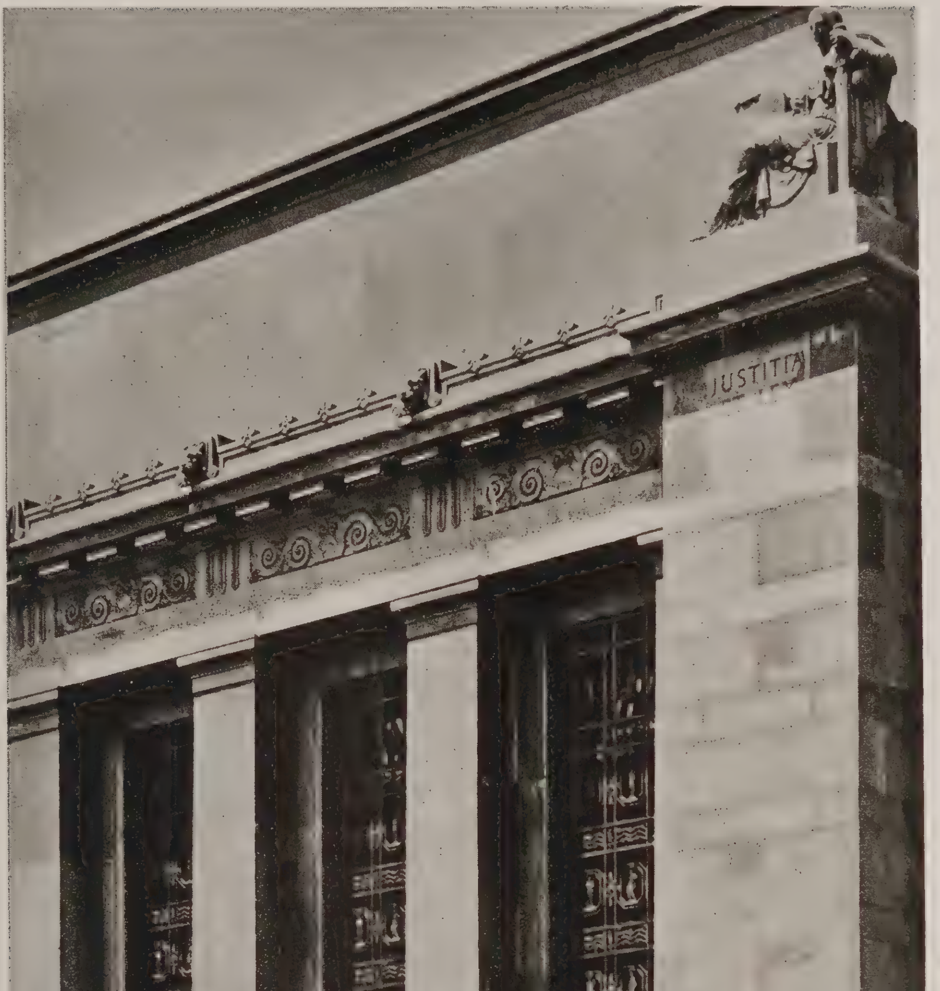

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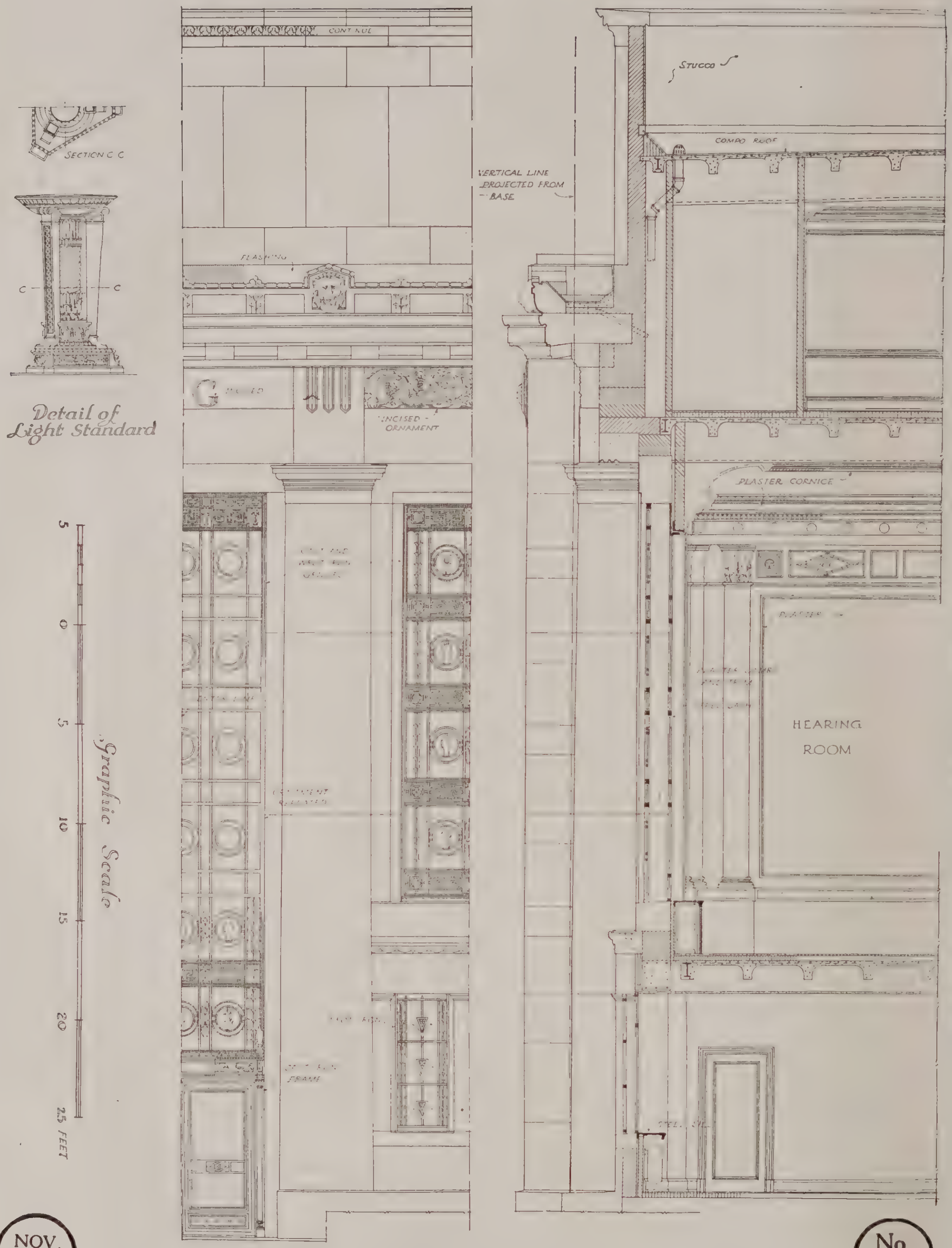

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No. 8

DETAILS OF EAST WALL

DETAILS, HARTFORD COUNTY BUILDING, HARTFORD

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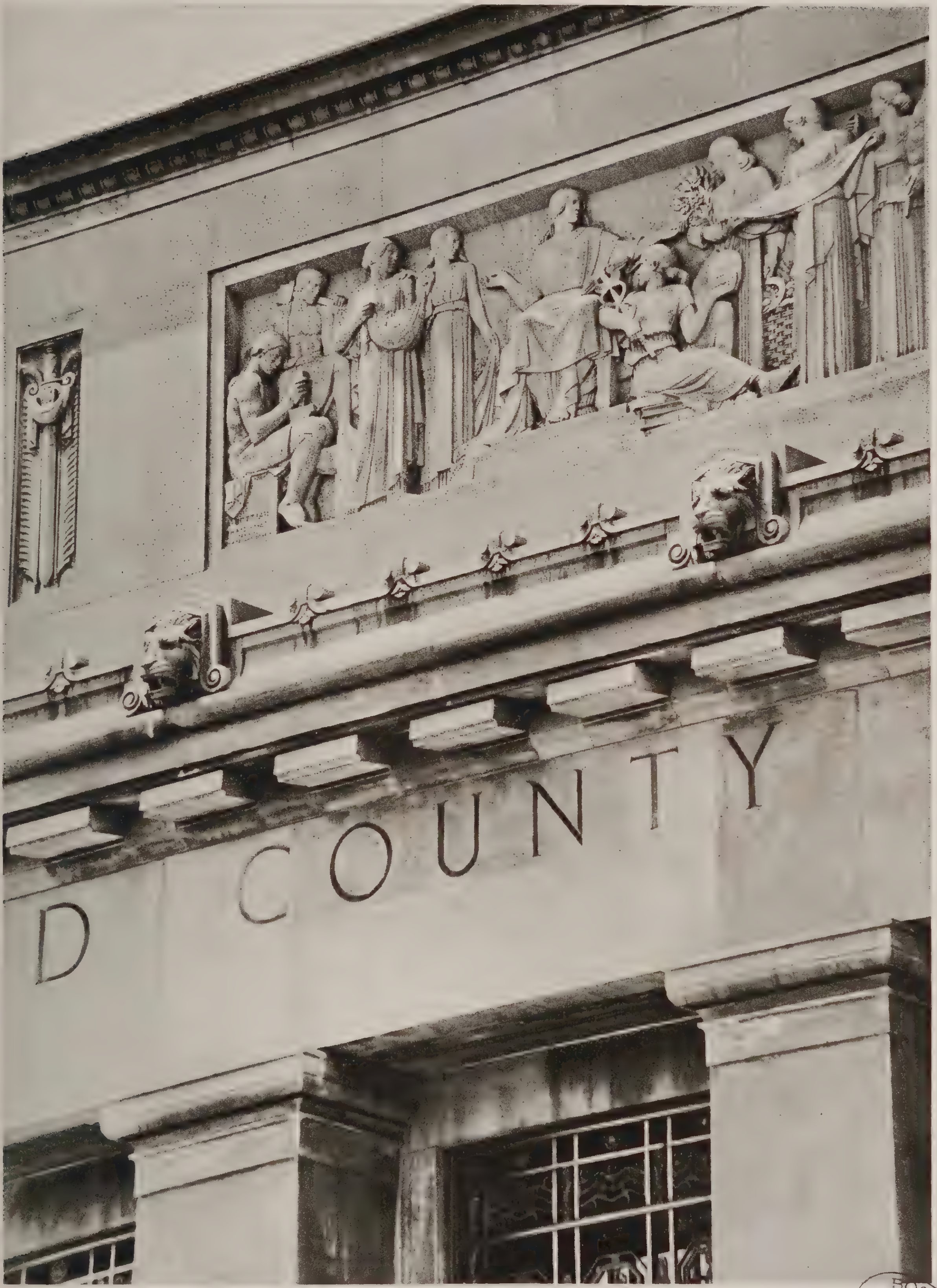

SCULPTURE, FRONT ELEVATION
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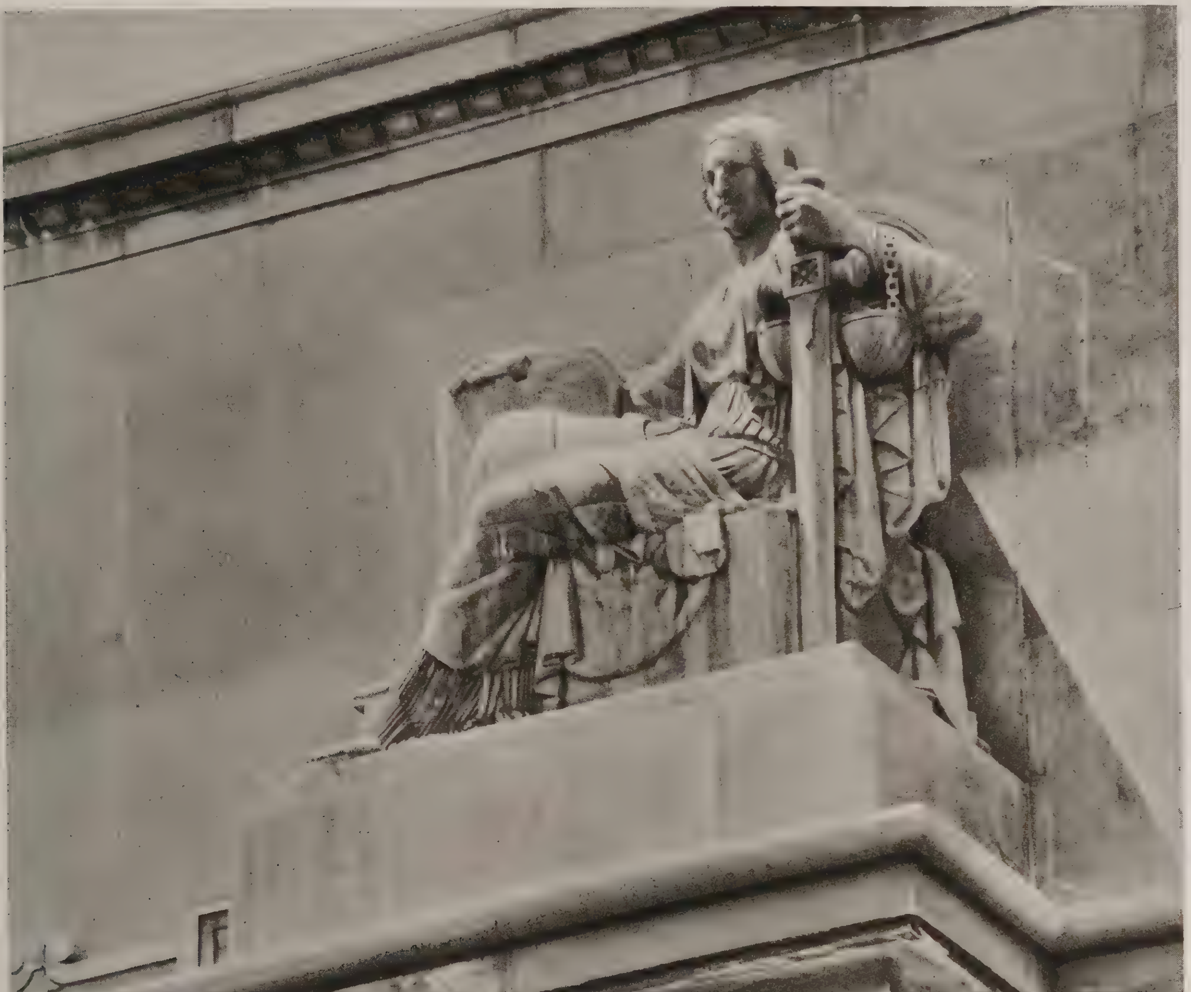

SCULPTURE, FRONT ELEVATION
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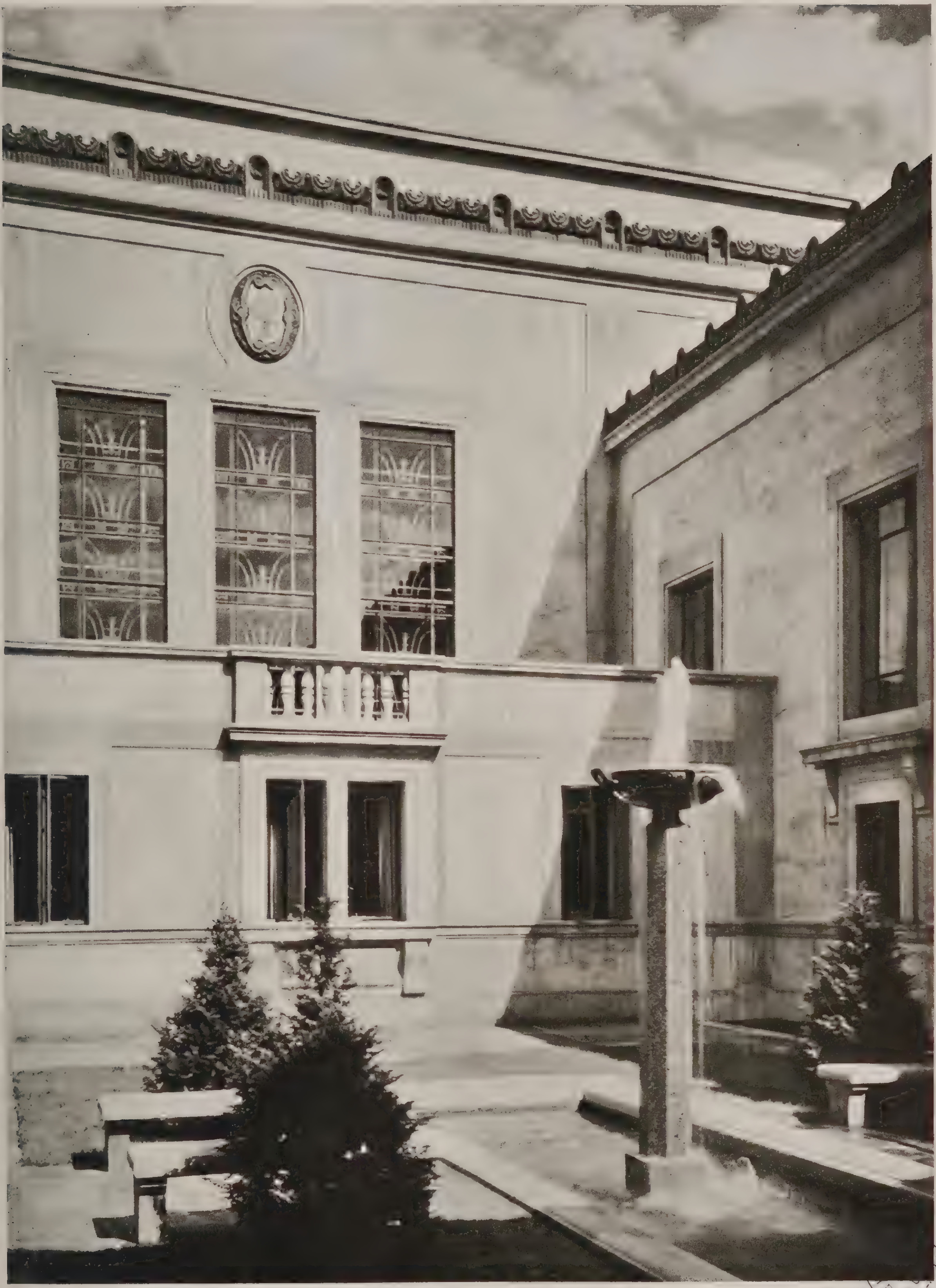

Details on Back

COURTYARD
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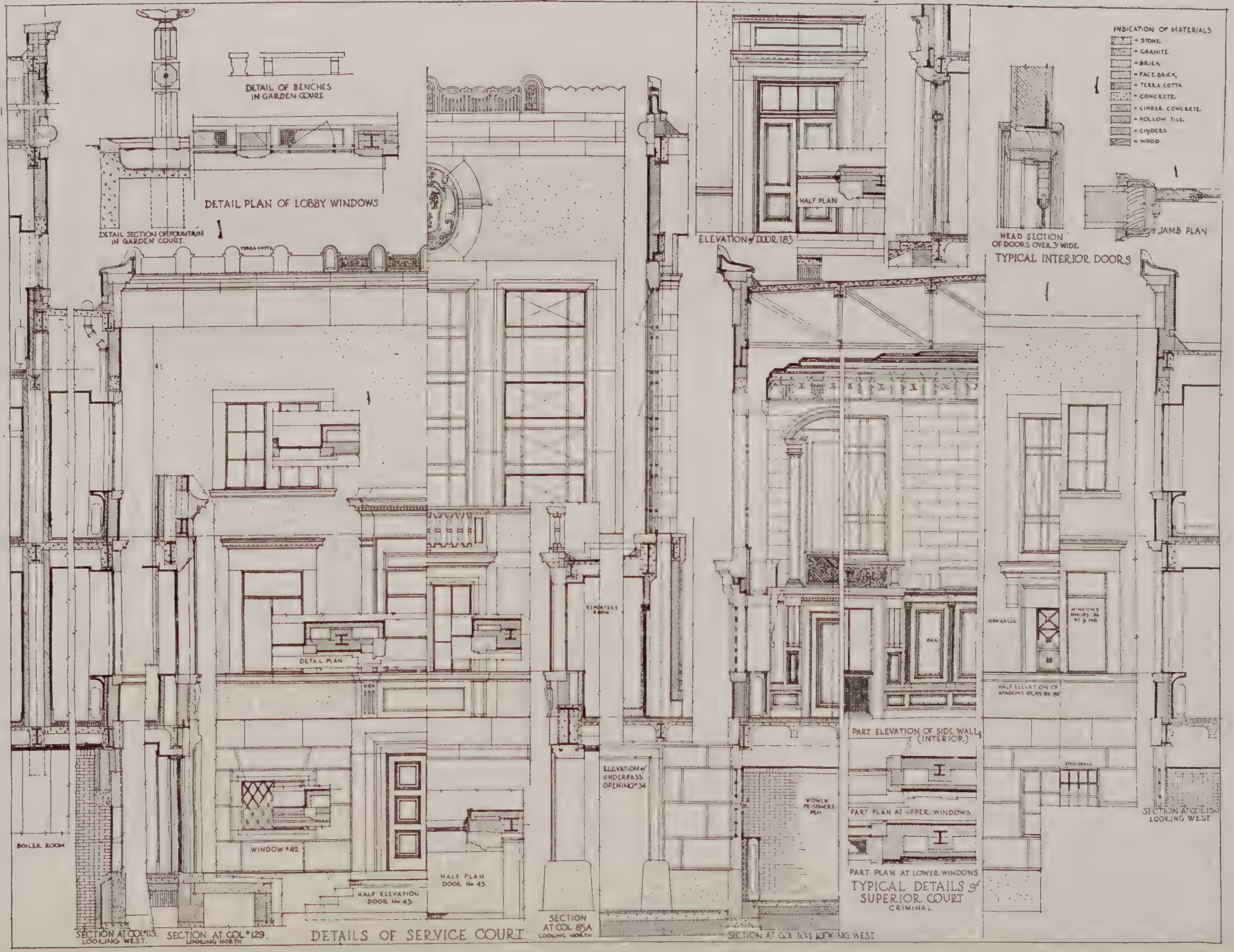
DETAIL OF BENCHES IN GARDEN COURT
DETAIL PLAN OF LOBBY WINDOWS
DETAIL SECTION OF FOUNTAIN IN GARDEN COURT.
TERRA COTTA
ELEVATION of DOOR 183
HALF PLAN
HEAD SECTION OF DOORS OVER 3' WIDE
JAMB PLAN
TYPICAL INTERIOR DOORS
INDICATION OF MATERIALS
= STONE
= GRANITE
= BRICK
= FACE BRICK
= TERRA COTTA
= CONCRETE
= CINDER CONCRETE
= HOLLOW TILE
= CINDERS
= WOOD
REPORTERS ROOM
IRON GRILLE
WINDOWS Nos 185 86 97 & 198
HALF ELEVATION OF WINDOWS 183, 185 84 185
PART ELEVATION OF SIDE WALL (INTERIOR)
STEEL GRILLE
DETAIL PLAN
ELEVATION of UNDERPASS OPENING #34
WOMEN PRISONERS PEN
PART PLAN AT UPPER WINDOWS
PART PLAN AT LOWER WINDOWS
TYPICAL DETAILS of SUPERIOR COURT
CRIMINAL
SECTION AT COL. 135 LOOKING WEST
BOILER ROOM
WINDOW #42
HALF PLAN DOOR No 43
HALF ELEVATION DOOR No 43
SECTION AT COL. 115 LOOKING WEST.
SECTION AT COL. 129 LOOKING NORTH
DETAILS OF SERVICE COURT
SECTION AT COL. 85A LOOKING NORTH
SECTION AT COL. 104 LOOKING WEST

NOV.
1929

No.
9

A SHEET OF TYPICAL DETAILS

DETAILS, HARTFORD COUNTY BUILDING, HARTFORD

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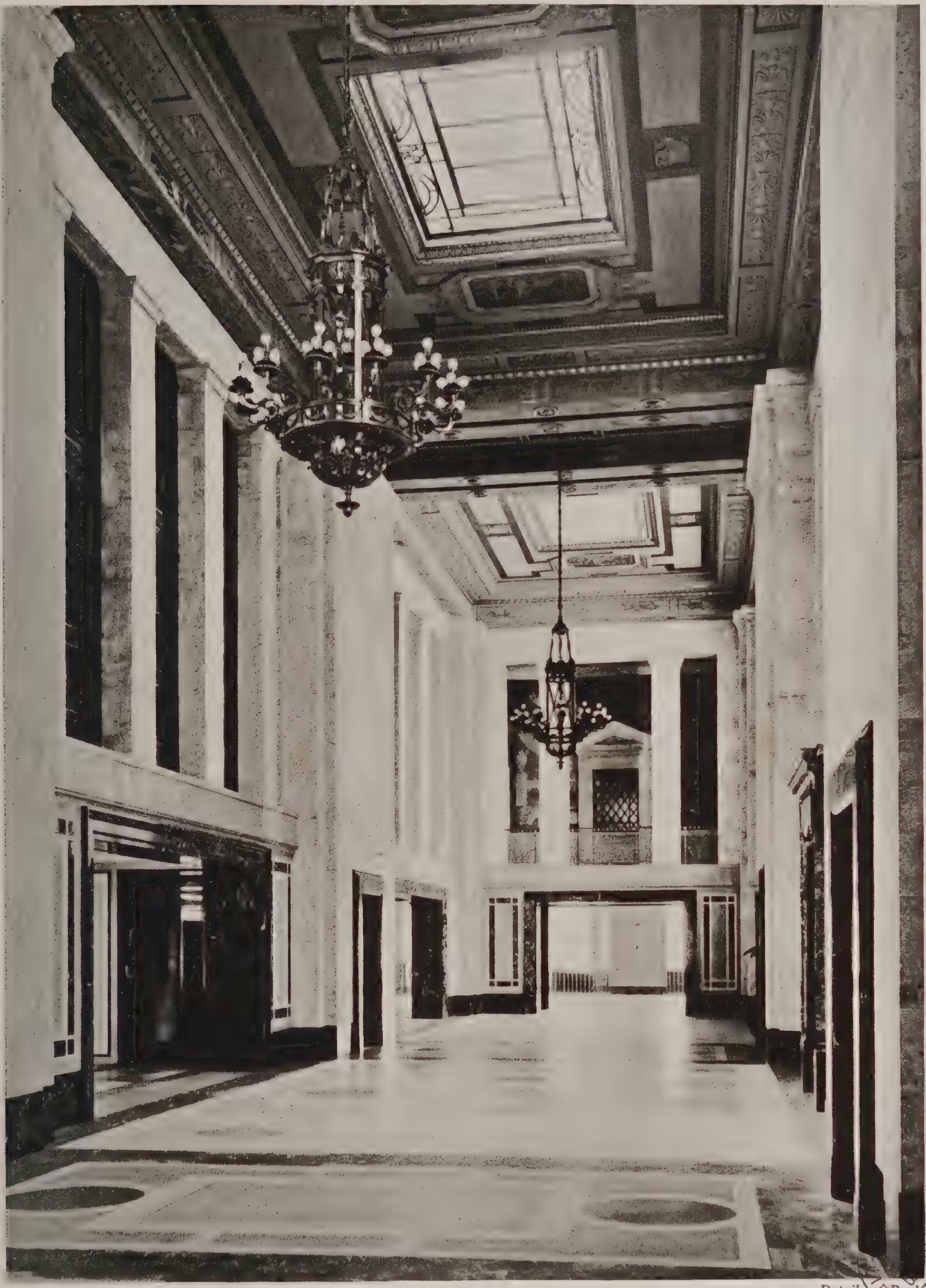
The ARCHITECTURAL FORUM DETAILS



Detail on Back

MAIN LOBBY
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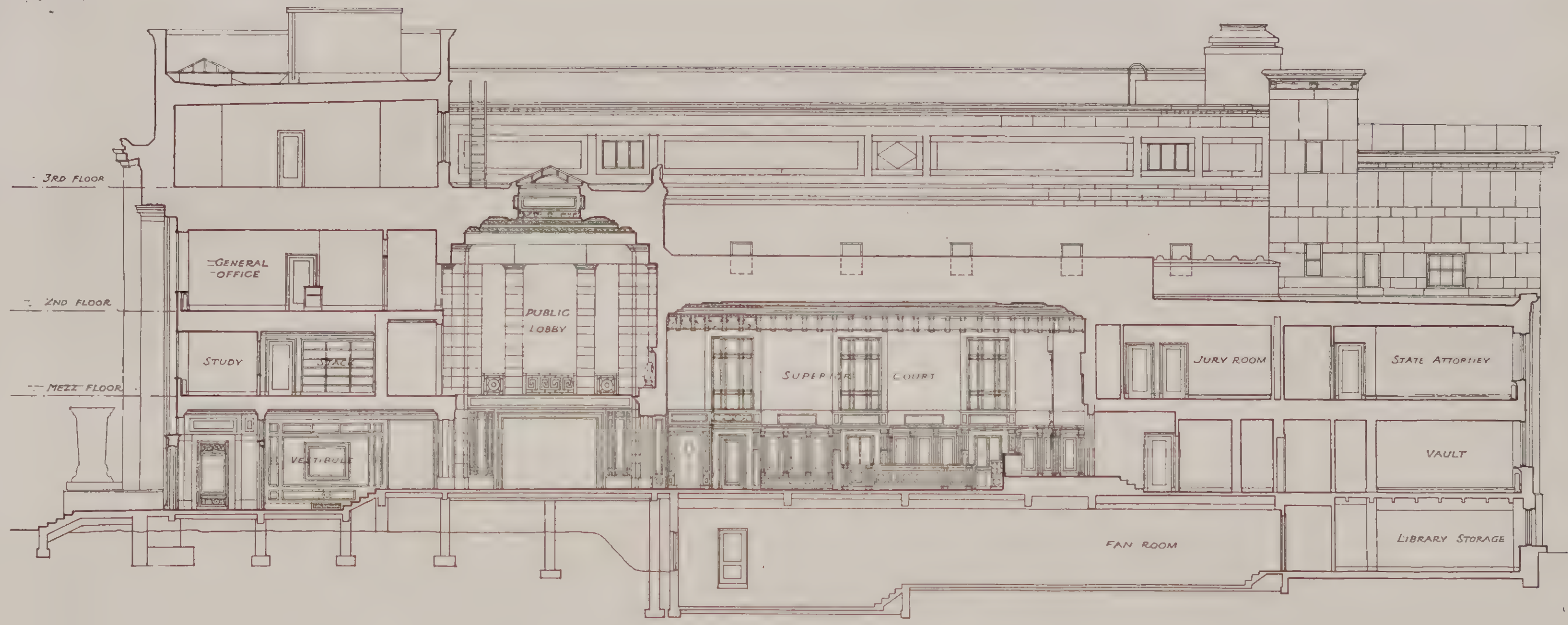
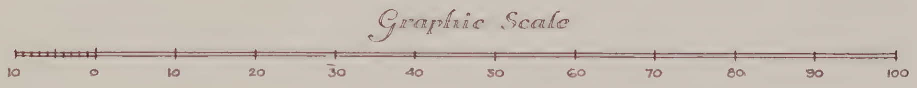


Longitudinal Section looking South.



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1929

DETAIL. HARTFORD COUNTY BUILDING, HARTFORD

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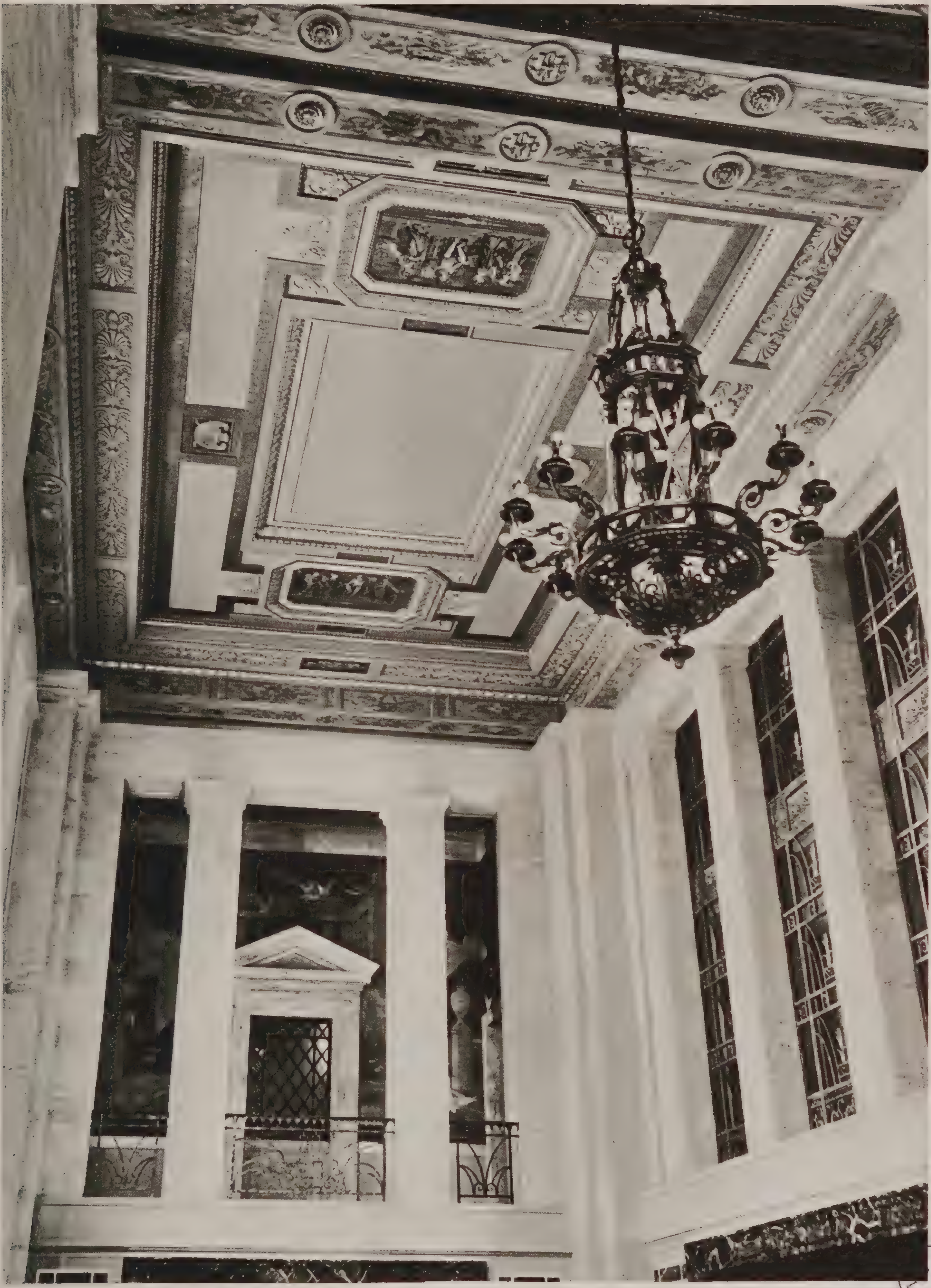

UPPER PART OF MAIN LOBBY
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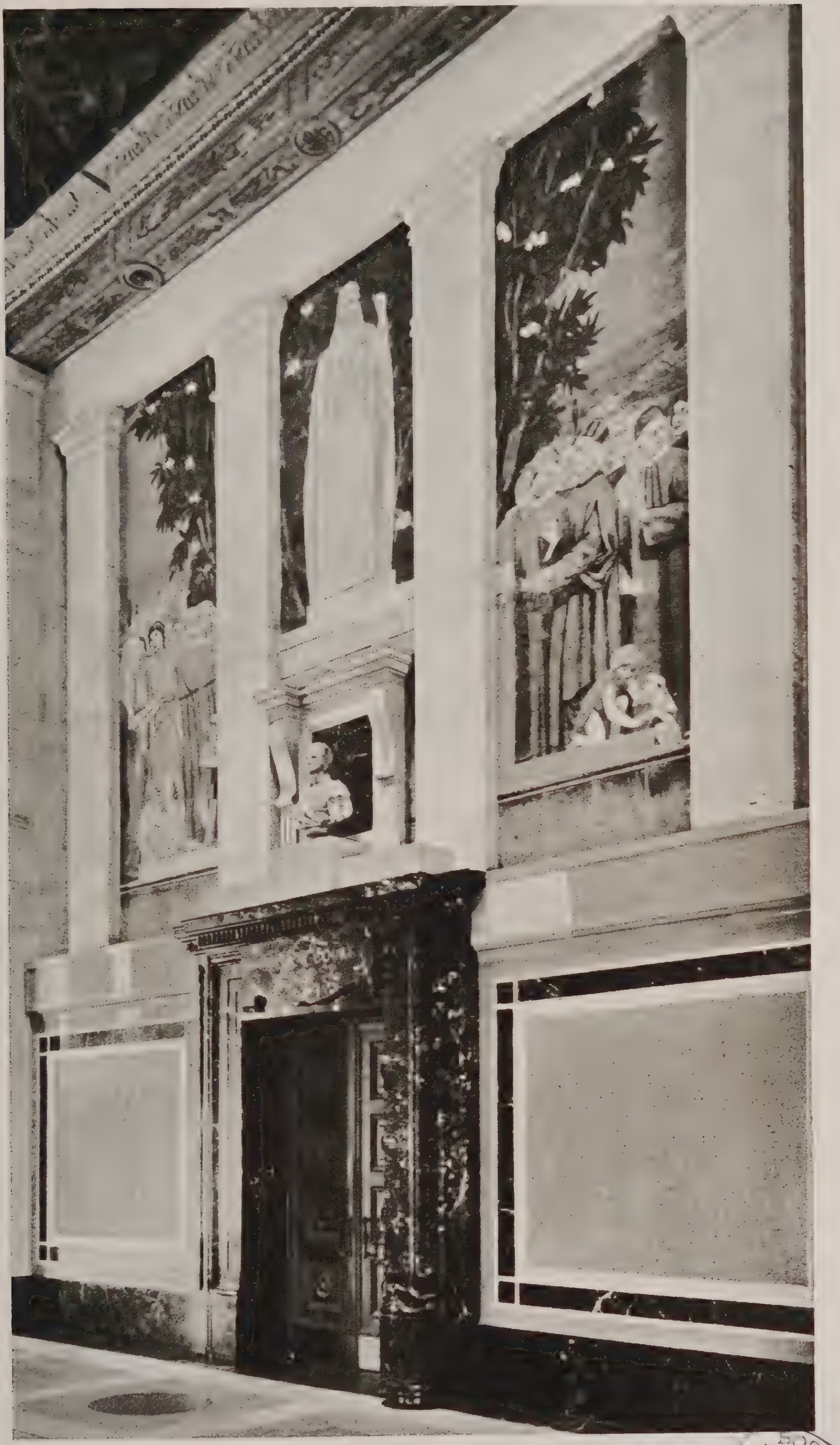

ENTRANCE TO CRIMINAL COURT ROOM
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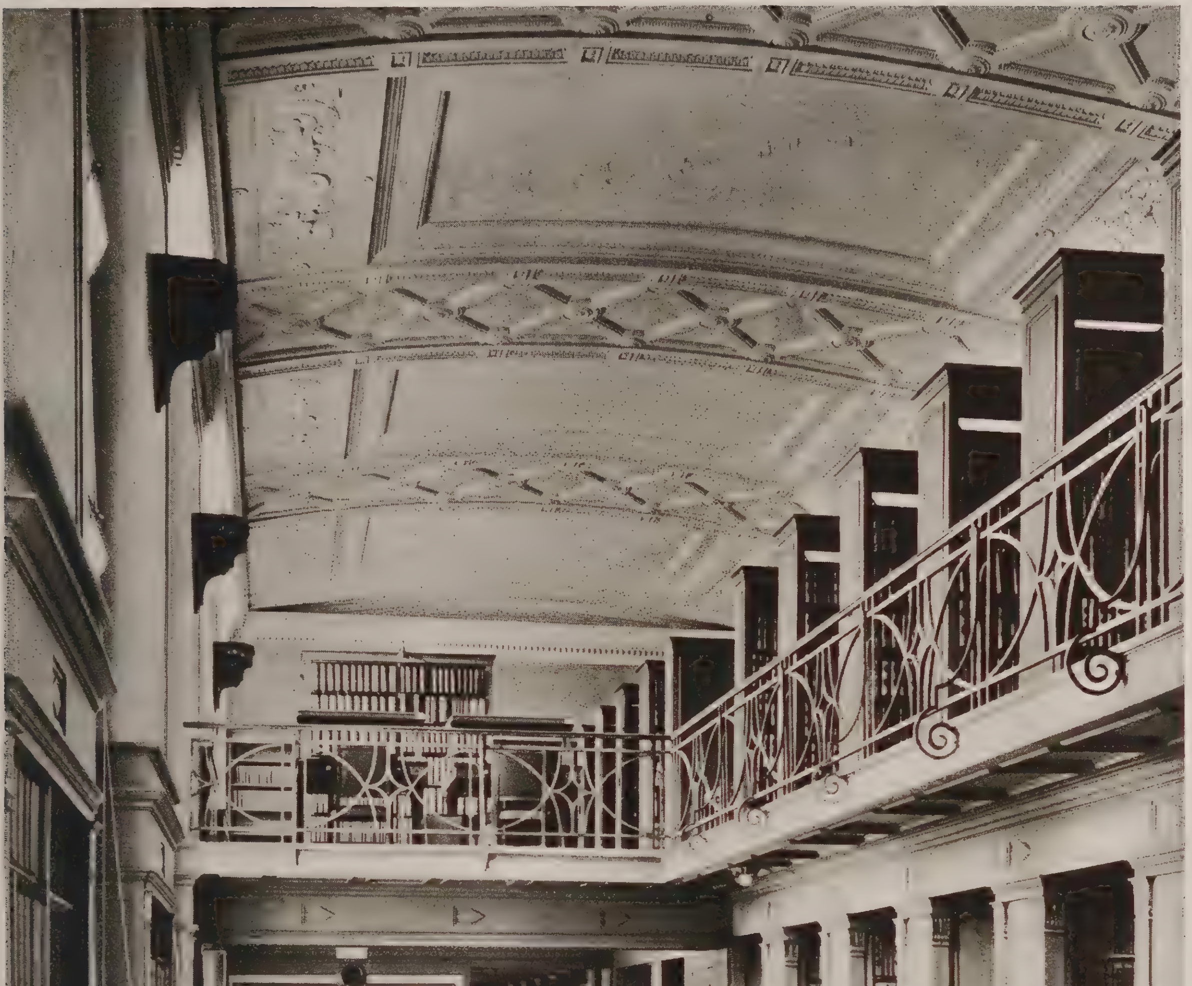

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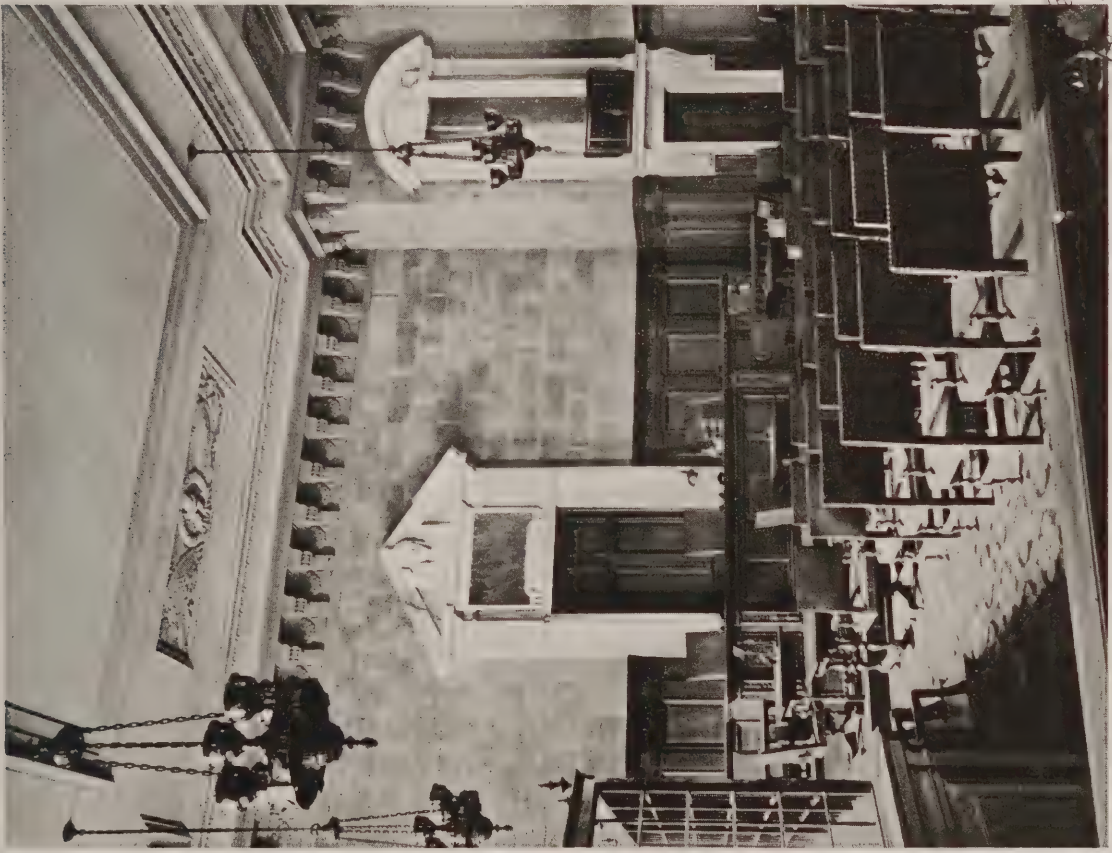
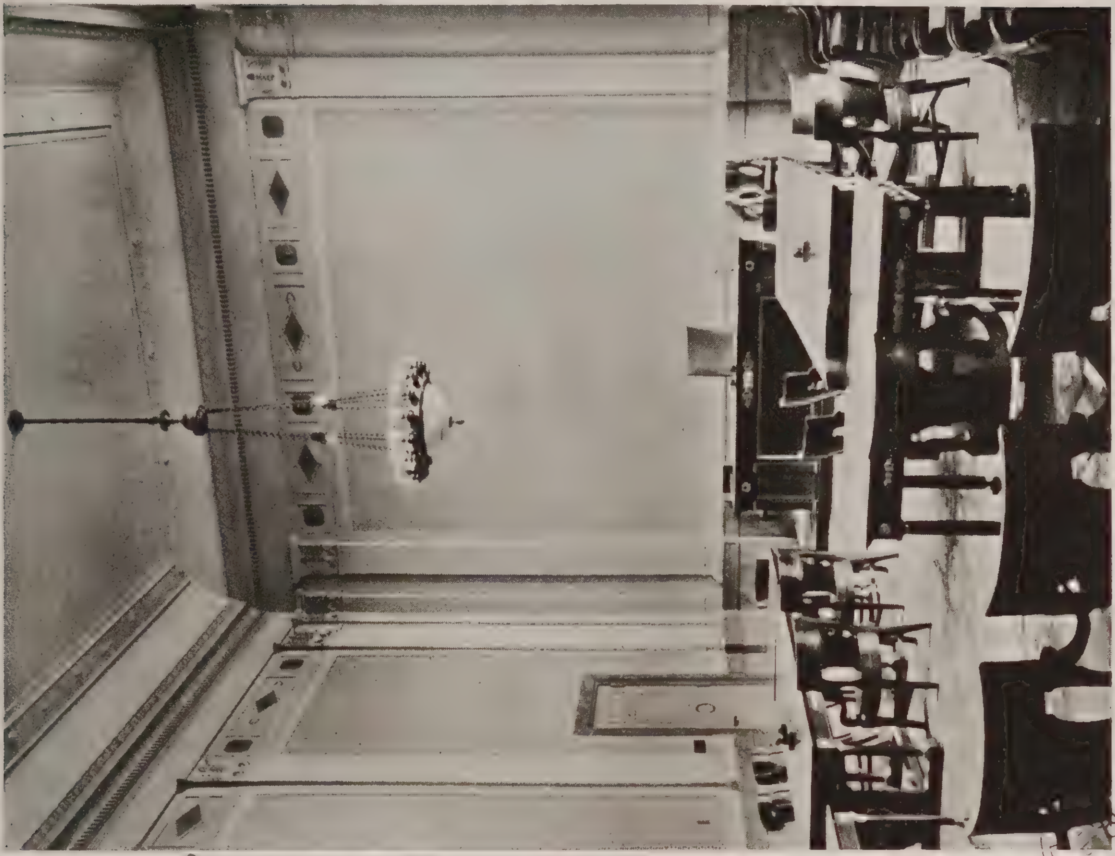


CRIMINAL COURT ROOM



SPECIAL HEARING ROOM

HARTFORD COUNTY BUILDING, HARTFORD

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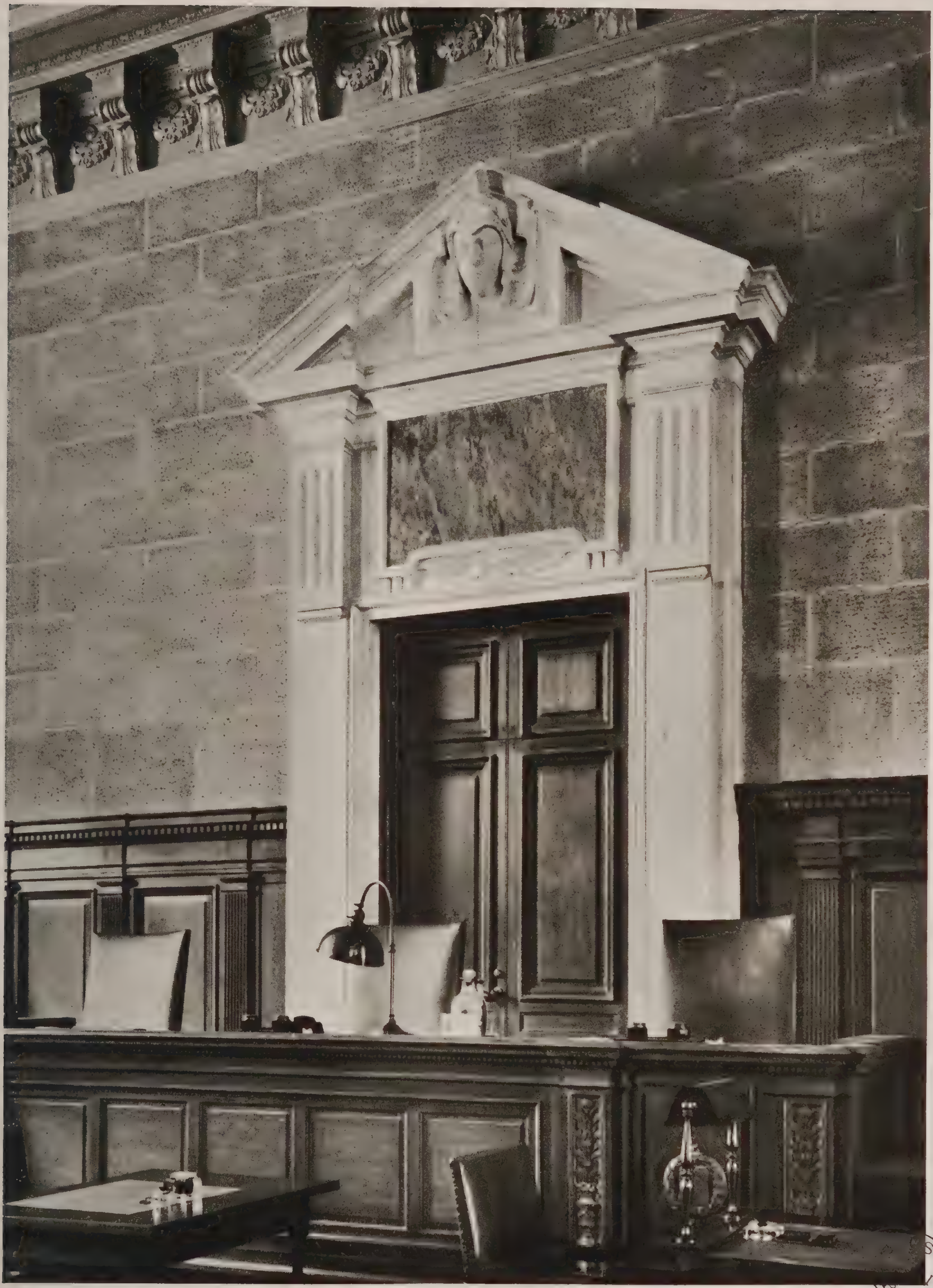

DETAIL, CRIMINAL COURT ROOM
HARTFORD COUNTY BUILDING, HARTFORD
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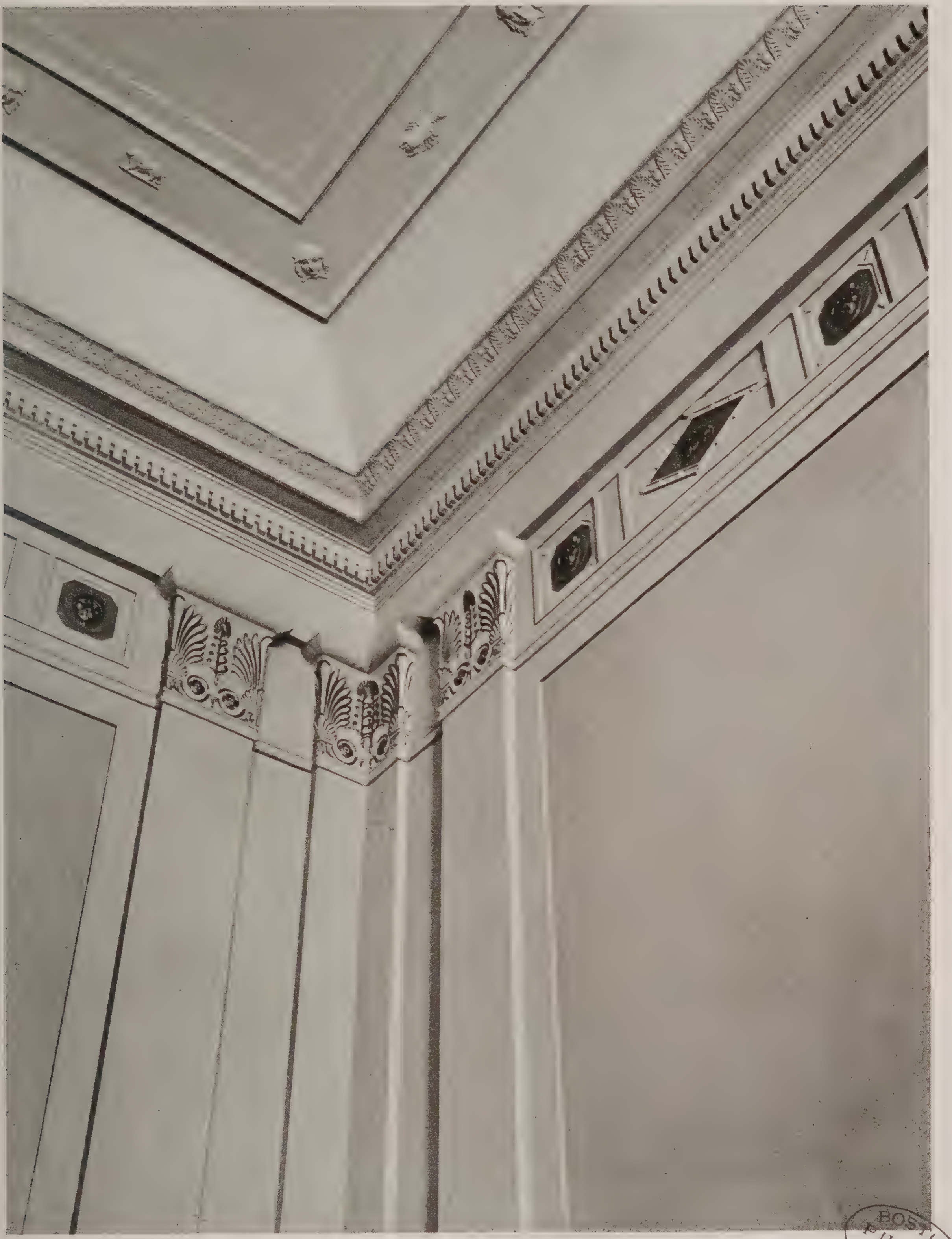

DETAIL, SPECIAL HEARING ROOM
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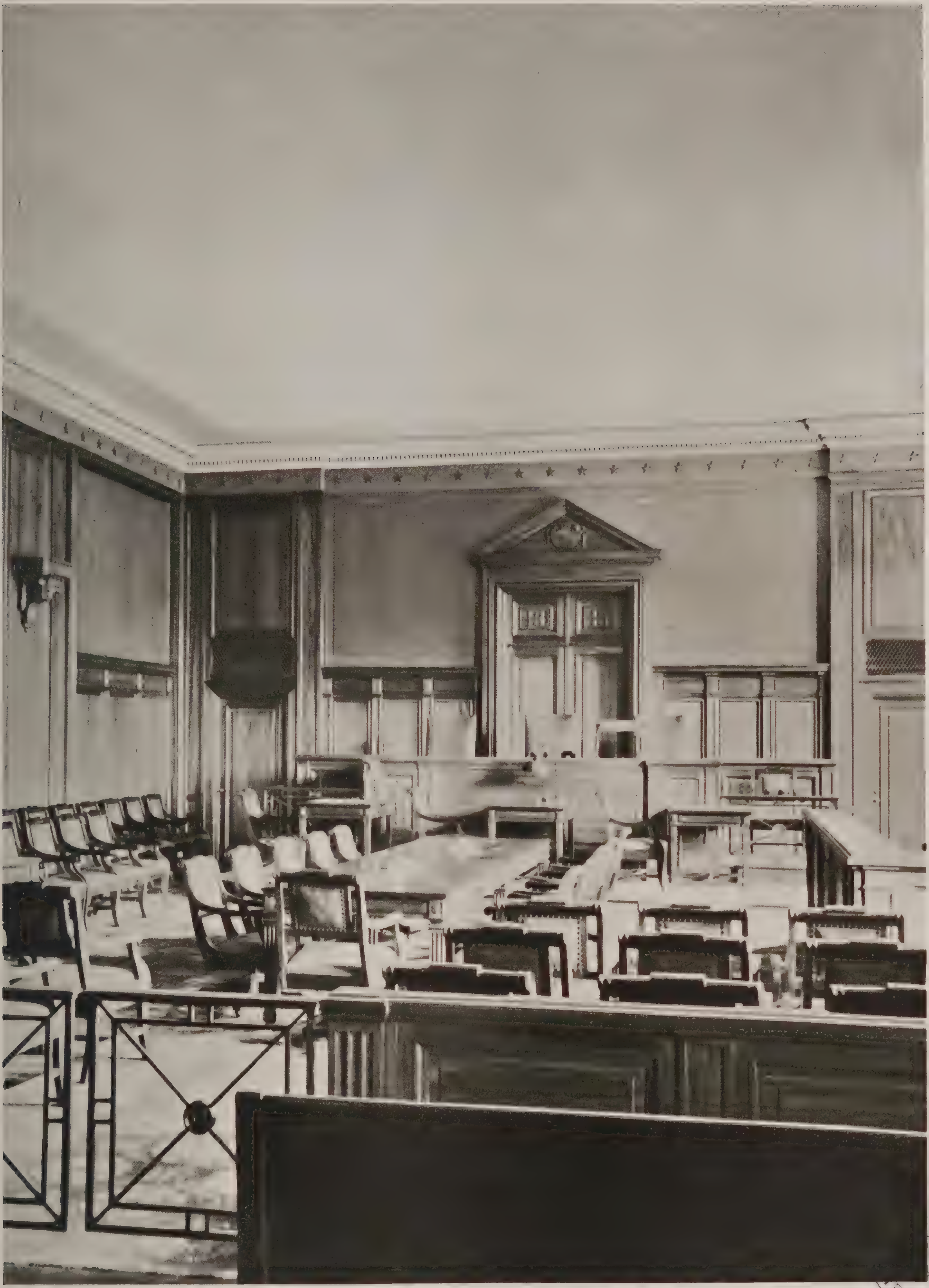

GENERAL COURT ROOM
HARTFORD COUNTY BUILDING, HARTFORD
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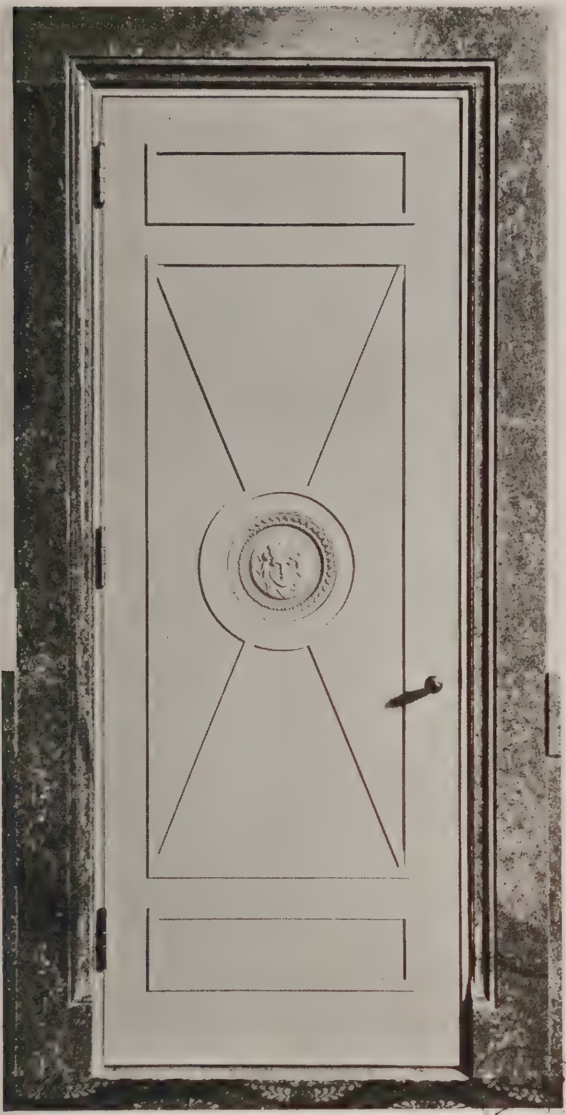
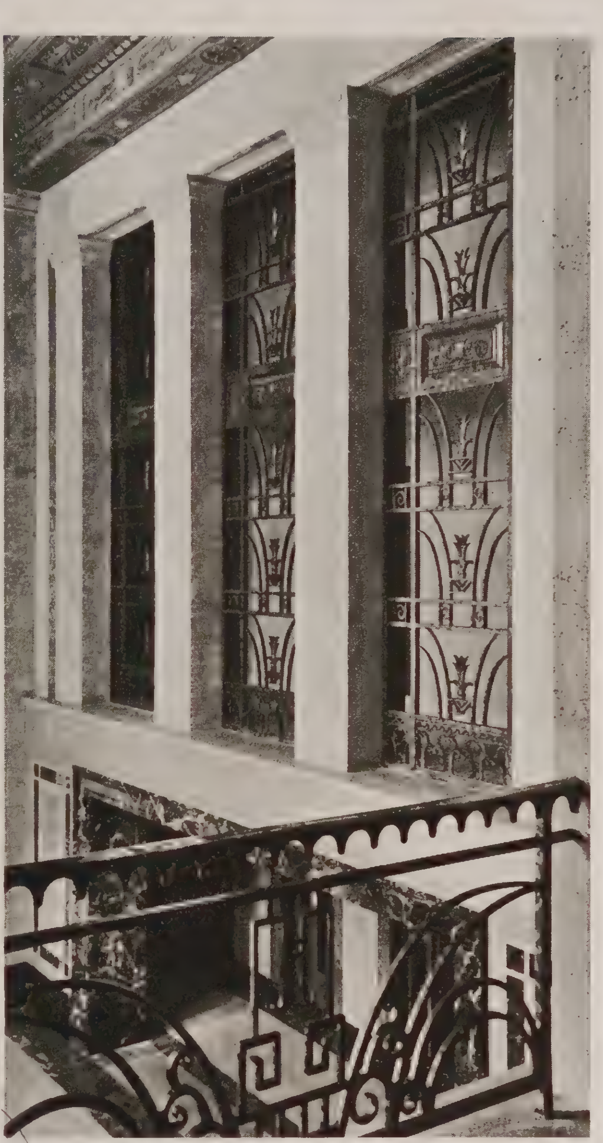


DOOR IN SPECIAL HEARING ROOM



METAL WORK, MAIN LOBBY

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THE BARCELONA EXPOSITION
A SPLENDID BUT COSTLY EFFORT OF THE CATALAN PEOPLE

BY

WILLIAM FRANCKLYN PARIS

NOTHING so reflects the character of a nation as its proverbs. The brief, pithy apothegms that fall trippingly from the lips of the man in the street are the distilled essence of centuries of observation and self-analysis; they are the pearls of wisdom handed down from generation to generation; they express the beliefs, the ethics, the morals, the spirit of a people.

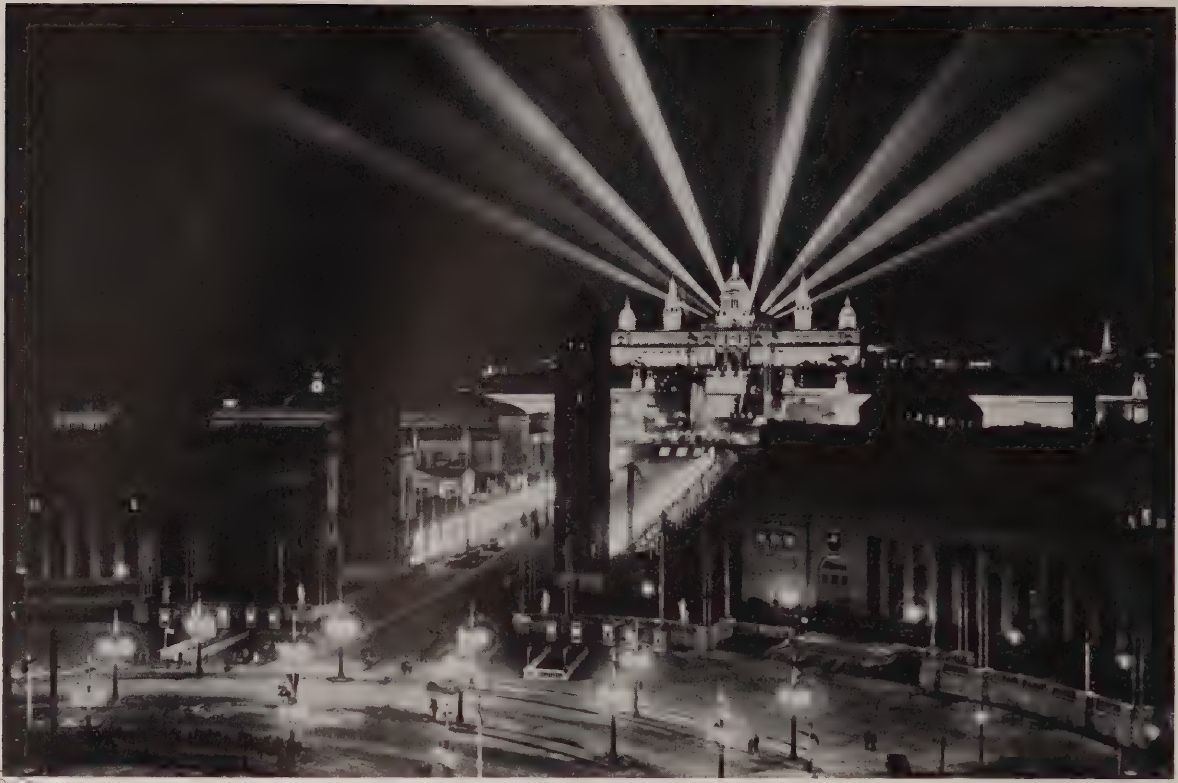
To all the world, the word *"Manana,"* which is a condensation of the proverb "Tomorrow will be time enough," has epitomized the indolent character of the Spanish people. The Spanish have always been reactionary. Spanish writers from the eighteenth century down to the day before yesterday wrote of the grandeur that was Spain and concluded with the fatalistic epitaph *"Espana Fuit."* Industry and trade were matters of contempt. To quote a sententious proverb: *"Iglesia O mar, O casa real quien quiere medrar,"*—"He that would succeed, let him enter the Church, the navy or the king's service."

Hard work is not highly prized among the Spaniards. One of their proverbs has it: *"Mas vale al que Dios ayuda que al que mucho madruga;"* in other words, "He whom God helps need not get up early in the morning." They believe that luck brings greater rewards than honest toil, and many of their proverbs reflect this conviction. *"Contra fortuna,"* they say, *"no vale arte ninguna"*: "Against hard luck all art is powerless"; *"All desdichado poco le vale ser esforzado"*: "If you are unlucky, there is no use trying"; *"Fortuna te de Dios, hijo, que el saber poco te basta"*: "God give you luck, son, for knowledge will serve you but little"; *"Poco te importa el ser sabio si no fueres venturoso"*: "Little will it serve you to be wise if you are not lucky as well." As for ambition, its value is appraised in the proverb "What's the use of anything? A man who is born a *cuarto* isn't going to turn out a *peseta.*"

In the face of all this evidence of the procrastinating temperament of the Spaniard, of his satisfaction with things as they are, of his skepticism as to the efficacy of hard work, one is struck with amazement by the splendid demonstration of energy just made in Barcelona where an International Exposition on a scale rivaling that of the expositions of Paris, London or Chicago is being held for the edification of the entire world. When one has been two days in Barcelona, however, one will have had the enigma explained, and when the visitor gets away from the Exposition he will carry with him a special admiration and respect for a particular and distinct type of Spaniard, a Spaniard who believes in hard work and progress,—a Catalan.

Catalonia has its own way of seeing things. As far back as the time of the Spanish-American war it replied to the Castilian cry of "Spain

Maria Christina Avenue, Barcelona Exposition



NIGHT VIEW, BARCELONA EXPOSITION

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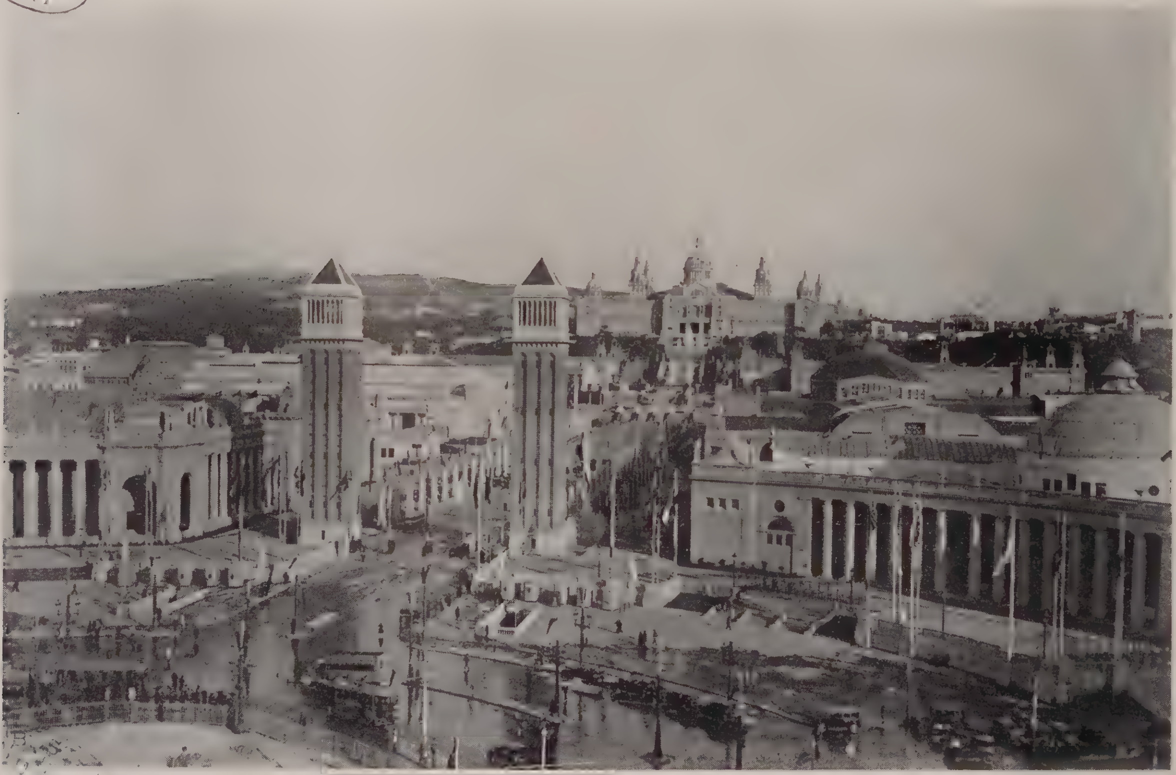

GENERAL VIEW, BARCELONA EXPOSITION

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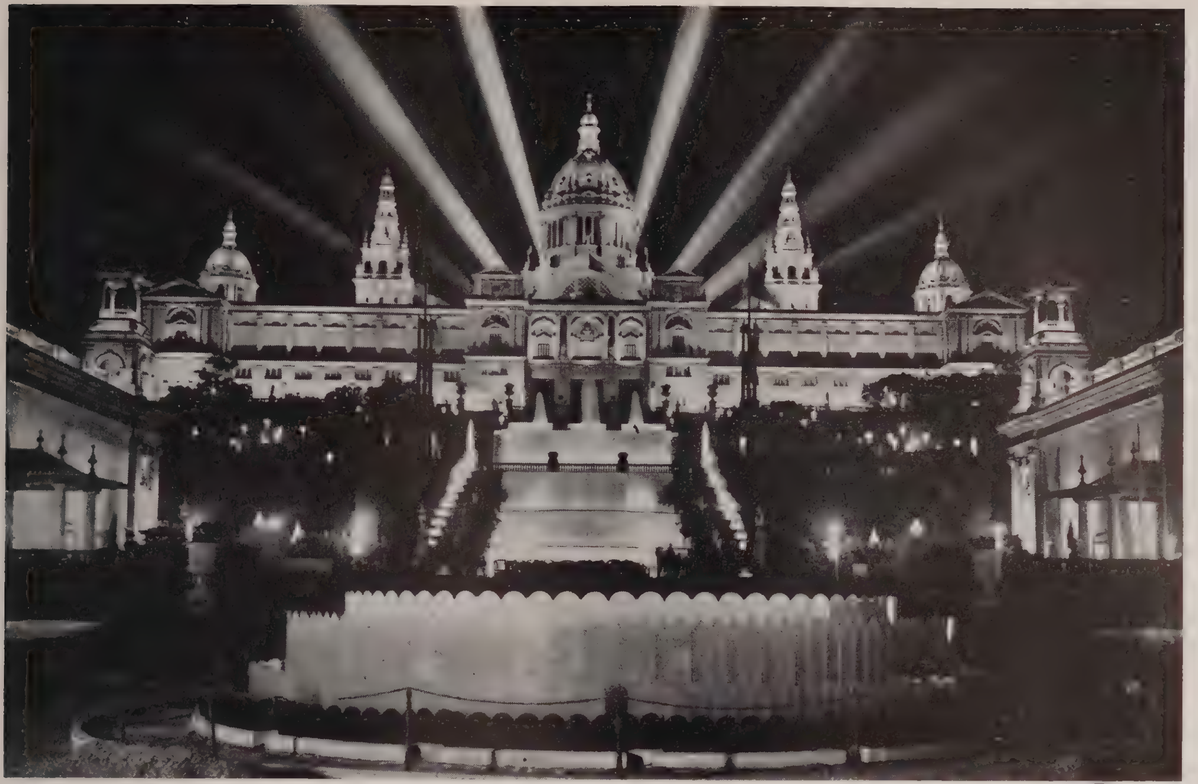

NIGHT VIEW, NATIONAL PALACE, BARCELONA EXPOSITION

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NATIONAL PALACE, BARCELONA EXPOSITION

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Maria Christina Avenue, Barcelona Exposition

knows how to die" by the cry of "Catalonia knows how to live." The Catalan point of view has ever been the opposite of the Spanish or Castilian point of view. Madrid governs; the other provinces are passive. Catalonia has an individuality, and it loses no occasion of asserting it. Barcelona pays in taxes to the government one seventh of the national budget and receives practically nothing in return, the cost of the military defences, of the improvement of the port, etc. having been borne entirely by the municipality. The Catalan people occupy the eastern part of the peninsula and the Balearic Islands, and Catalonia extends over 68,000 square kilometers, a territory three times larger than Belgium. Its population exceeds six millions, and as far back as 1885 it sent a petition to the king asking autonomy. This having been denied, a separationist party was formed which is daily growing in numbers. The Catalans are Catalans first, last, and all the time. They have their own dialect, and they print their newspapers and school books in Catalan. They will shoulder the cost of the Exposition,—a ruinous cost,—but they want the credit for doing it. The tax payers of Barcelona have already disbursed 160 million *pesetas* in connection with the construction and maintenance of the Exposition buildings and grounds, and of this amount only 10 million *pesetas* was contributed by the State. The Catalans will even tell you that the Exposition of Seville was deliberately encouraged and its promoters financially assisted by the government to embarrass the promoters of the Barcelona Exposition, to curb Catalonian pride and to nullify its propaganda. The regional spirit is strong in Barcelona, and this is probably an exaggerated view, but it is no secret that Madrid is jealous of Barcelona and envies its prosperity.

What has added to the costliness of the Exposition is the fact that the only available site for it was the side of the mountain of Montjuich, which dominates Barcelona on the south. An area of 400 acres of steep hillside had to be converted into a magnificent park graded into a series of terraces connected by easy slopes. The head landscape architect of Paris, M. Forrestier, was called in, and there is no doubt that he has given Barcelona as noble a series of terrace gardens as are to be found anywhere in Europe. The fact remains, however, that the Park of Montjuich is built on the side of a steep and lofty mountain, and that its ascent involves some puffing. Visitors to the Exposition who view it in the orthodox

Magic Fountain Square, Barcelona Exposition

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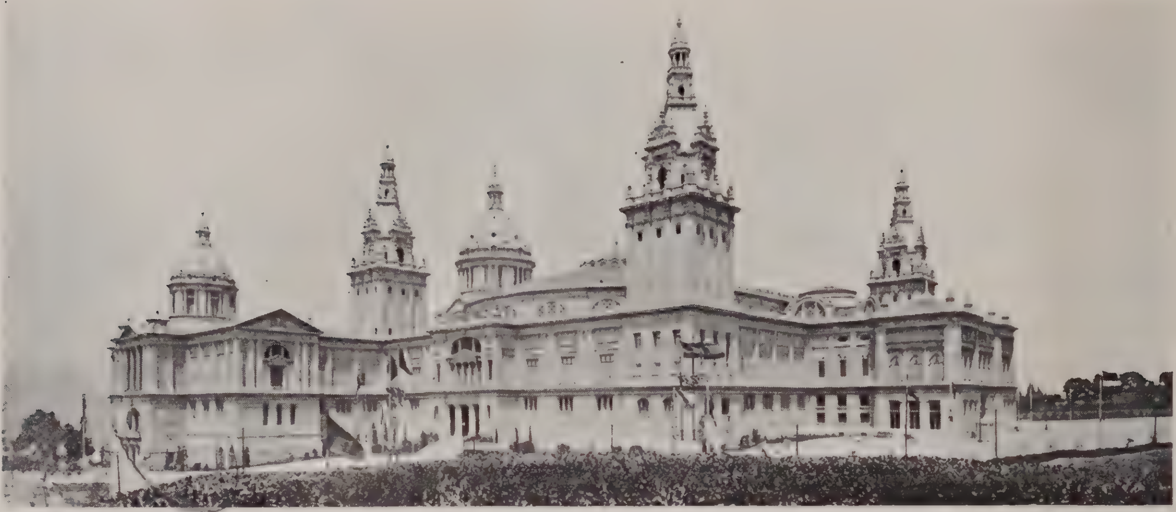
way, from the base to the summit, have a laborious time of it, and one viewing it from the top down has the inconvenience of viewing the buildings from the rear or from some angle not contemplated by the architects.

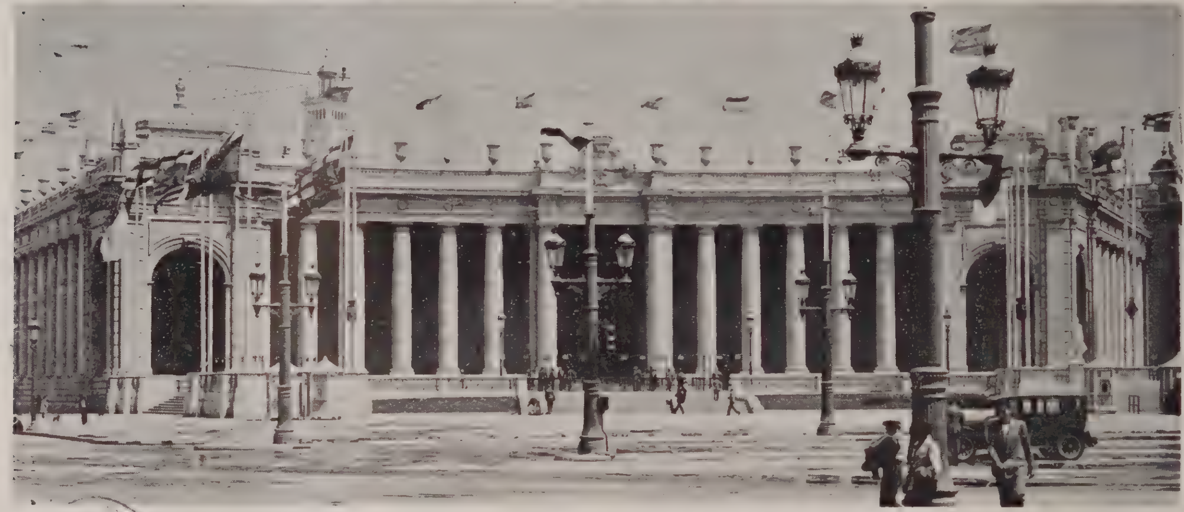
The monumental gate to the Exposition is at the base of Montjuich Hill. It opens off an oval plaza, designated as the Plaza de Espana, at the center of which is a monumental fountain designed by the architect, Jose Maria Jujol, with sculpture symbolizing the Tagus, the Guadalquivir and the Ebro, by Miguel Blay. On the side of the plaza upon which the entrance is located, two colonnaded buildings serve as wings to two rectangular towers rising to the height of 47 meters and obviously inspired by the campanile in Venice. The structures that flank these two towers are built on a concave curve, with a Renaissance peristyle for the Transportation Building and a Grecian peristyle for the Palace of Dress. The first is by the architects A. Florensa and F. de Azua, and the second by J. M. Jujol and A. Calzada. There is nothing particularly original about either, and they reflect, as do most of the Exposition's buildings, a respect for tradition and a close following of the models of the past. The influence of the Paris Exposition of Art Moderne of 1925 has not been felt by the architects of the Barcelona Exposition.

On the main axis with the monumental entrance runs a broad avenue, at the head of which, on an elevation of several hundred feet, reached by the pedestrian by ascending a million steps disposed on either side of a wide cascade, is the *clou* of the Exposition, the National Palace, a huge edifice covering 32,000 square meters and containing an auditorium seating 20,000. This is a well balanced structure, designed by the architects D. Enrique Cata and Pedro Cendoya from two perfectly good models,—the Escorial and St. Peter's in Rome. It has side towers rising to a height of 60 meters, a little ornate in design, but the ensemble strikes the eye with perfect expectedness and does not offend, unless lack of inventiveness and originality constitutes offence.

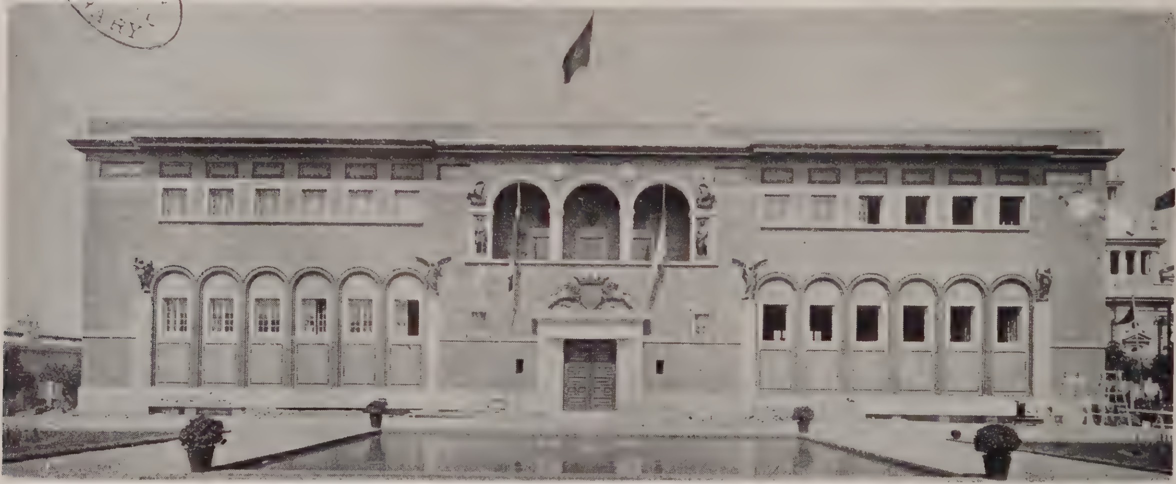
If so, the Moderns will criticize the State Building, by the architect Antonio Darder, which is almost a reproduction of the Monterey Palace at Salamanca, and the Palace of Deputations by Enrique Sagnier, a pleasing symmetrical structure of Gothic Plateresque architecture, the prototype of which may be found in many Spanish municipalities. This thraldom to old formulæ is less apparent in the Textile Building by Juan Roig



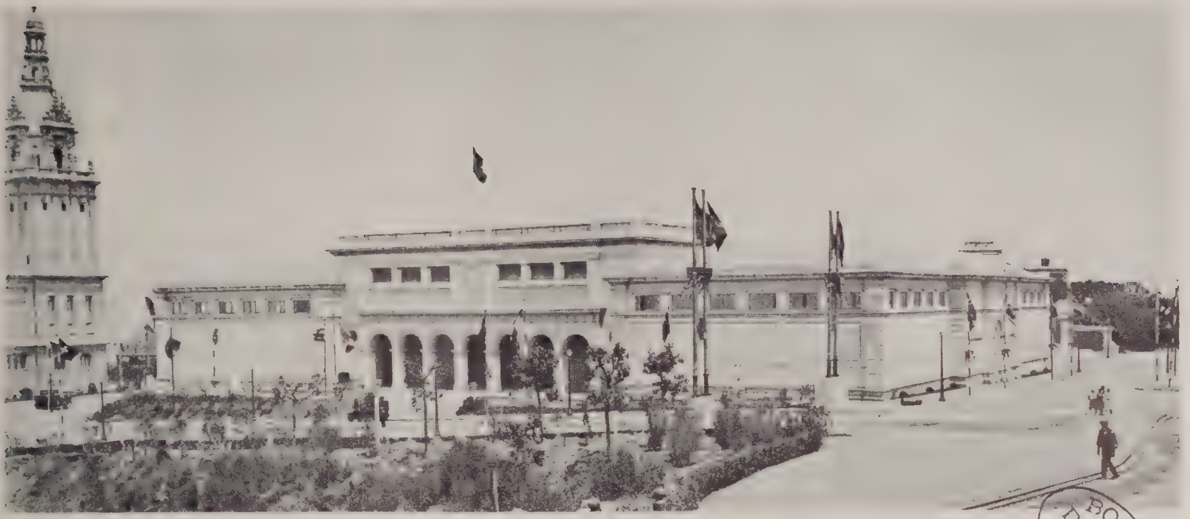
NATIONAL PALACE



COMMUNICATIONS AND TRANSPORTS PALACE
A. FLORENSA AND F. DE AZUA, ARCHITECTS



PAVILION OF THE CITY OF BARCELONA, BARCELONA EXPOSITION
JOSE GODAY, ARCHITECT



MODERN ART PALACE
ANTONIO DARDER, ARCHITECT

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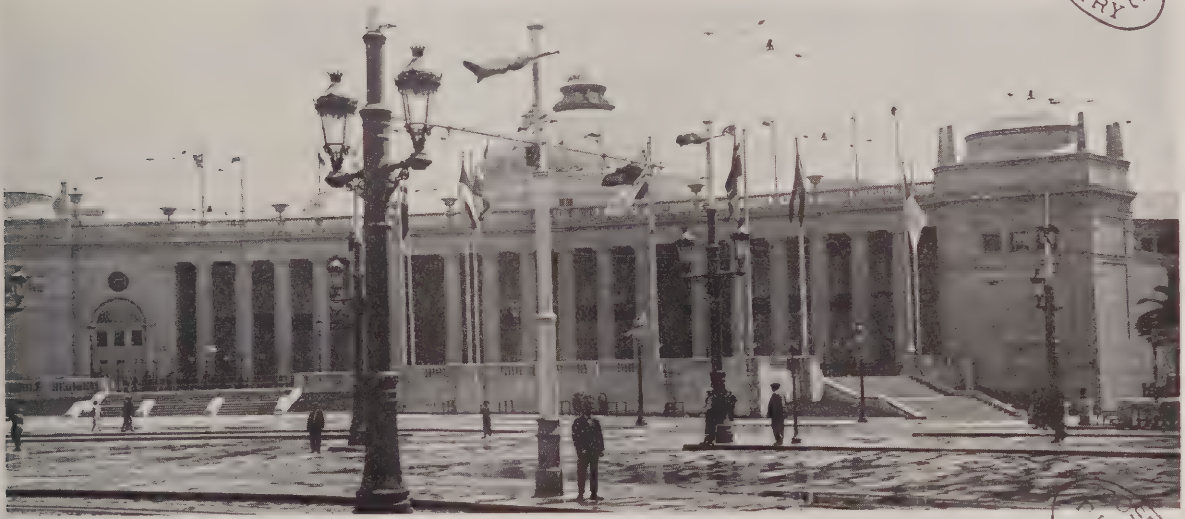

PALACE OF DRESS
J. M. JUJOL AND A. CALZADA, ARCHITECTS

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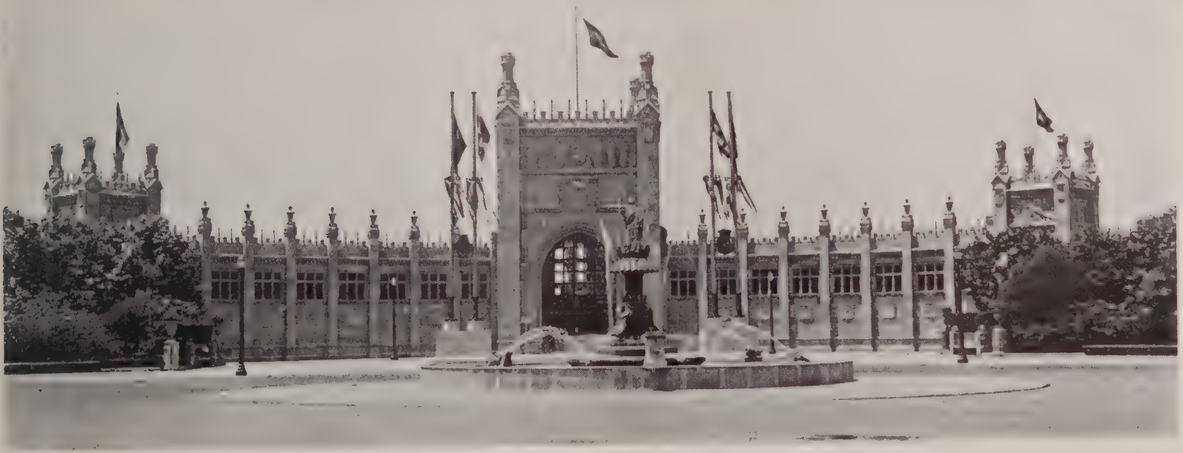
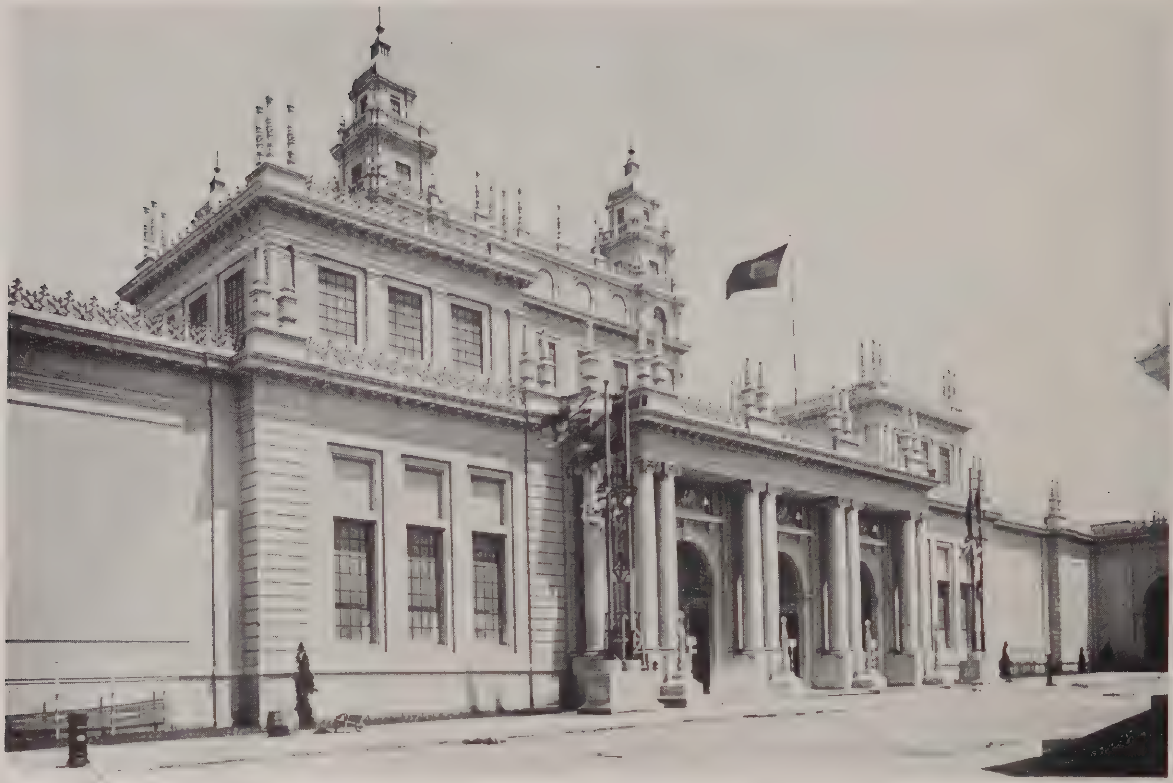
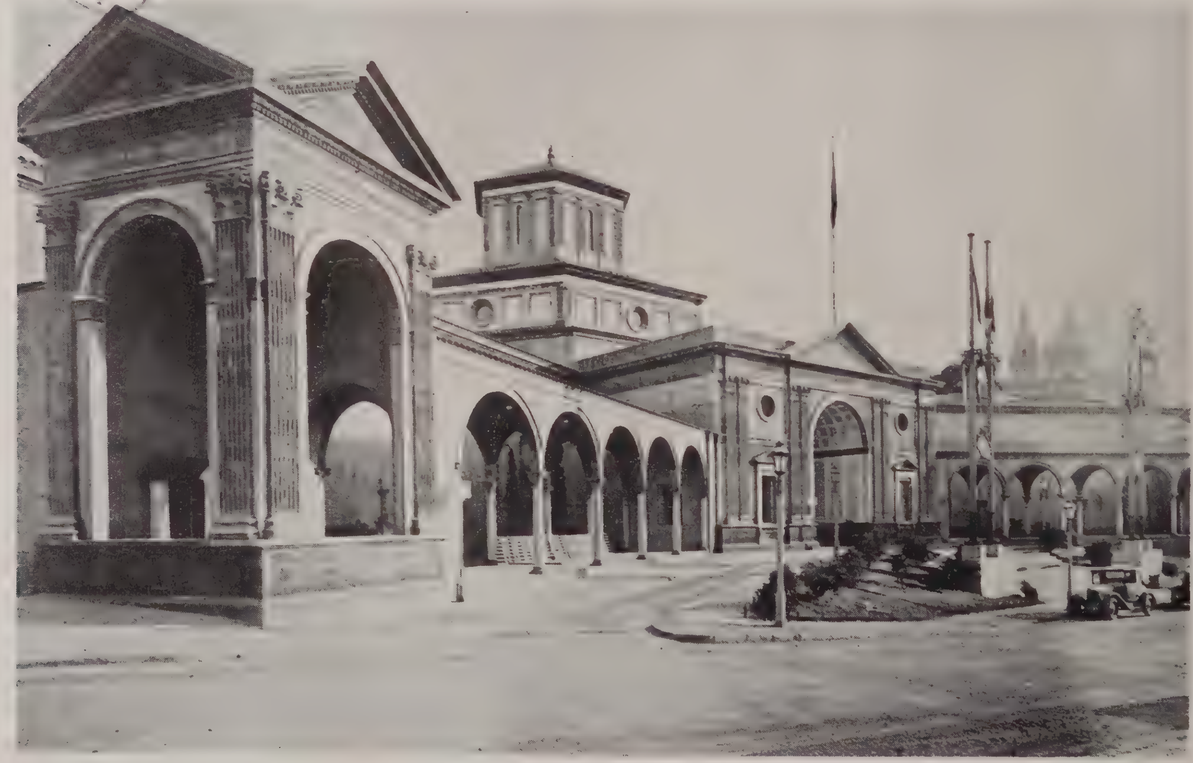


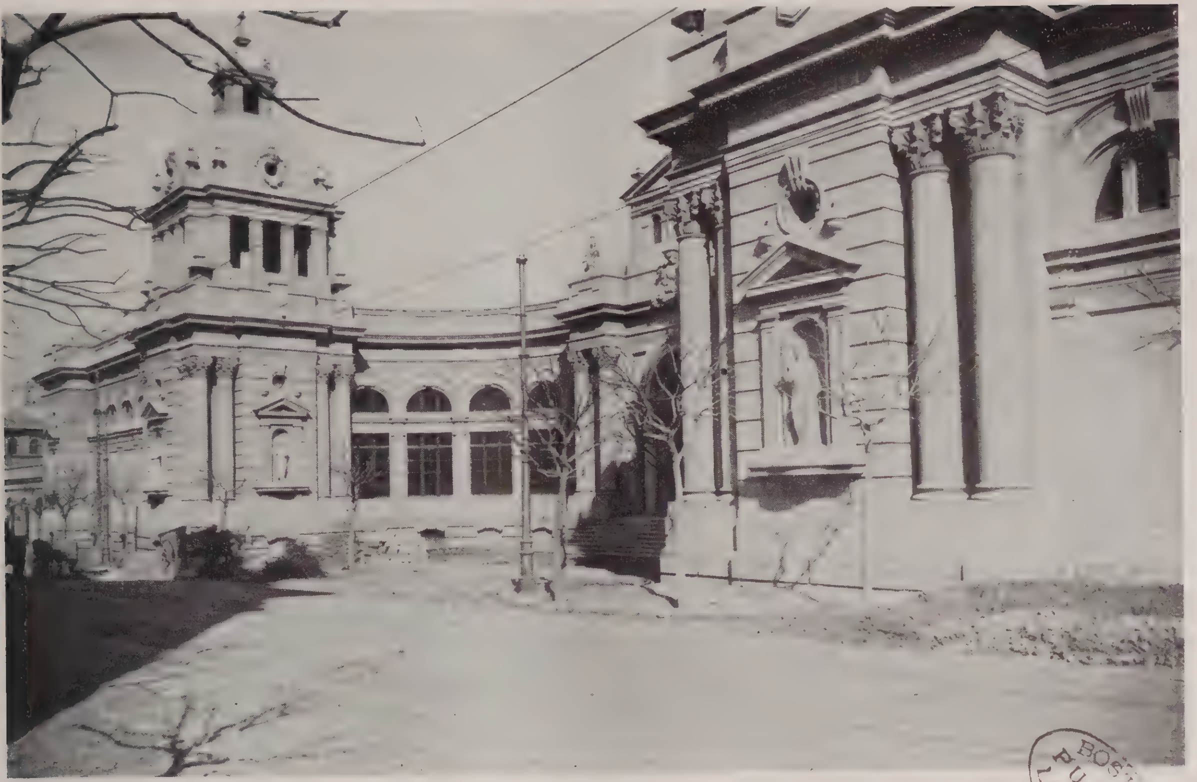
PALACE OF DEPUTATIONS, BARCELONA EXPOSITION
ENRIQUE SAGNIER, ARCHITECT



PALACE OF TEXTILE ARTS
D. E. CANOSA AND JUAN ROIG, ARCHITECTS



PALACE OF GRAPHIC ARTS, BARCELONA EXPOSITION



EXTERIOR VIEW, PALACE OF DECORATIVE AND APPLIED ARTS

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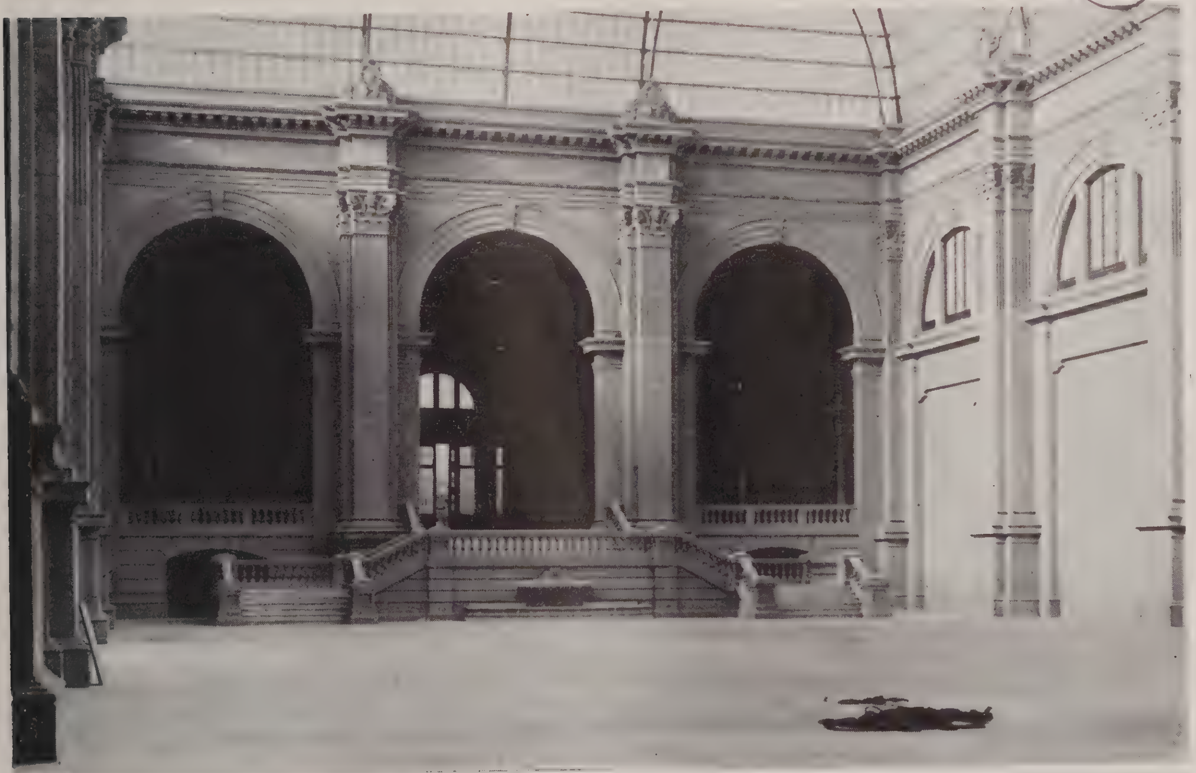
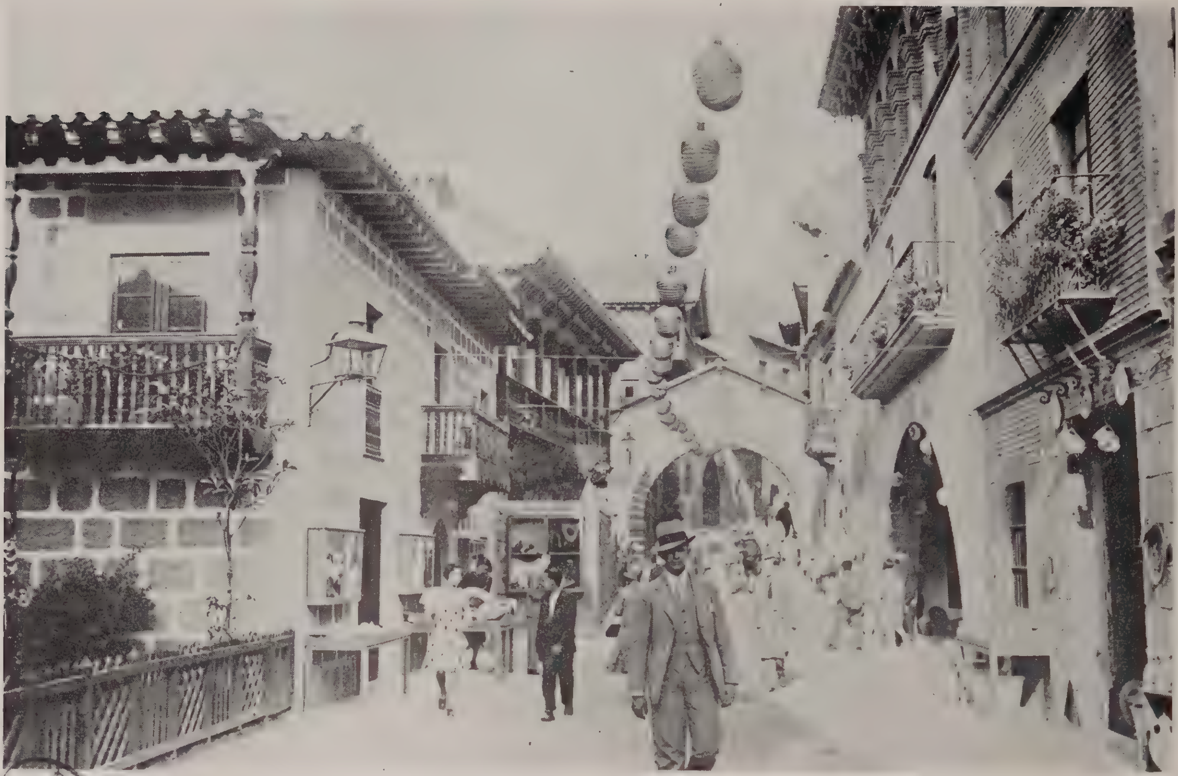
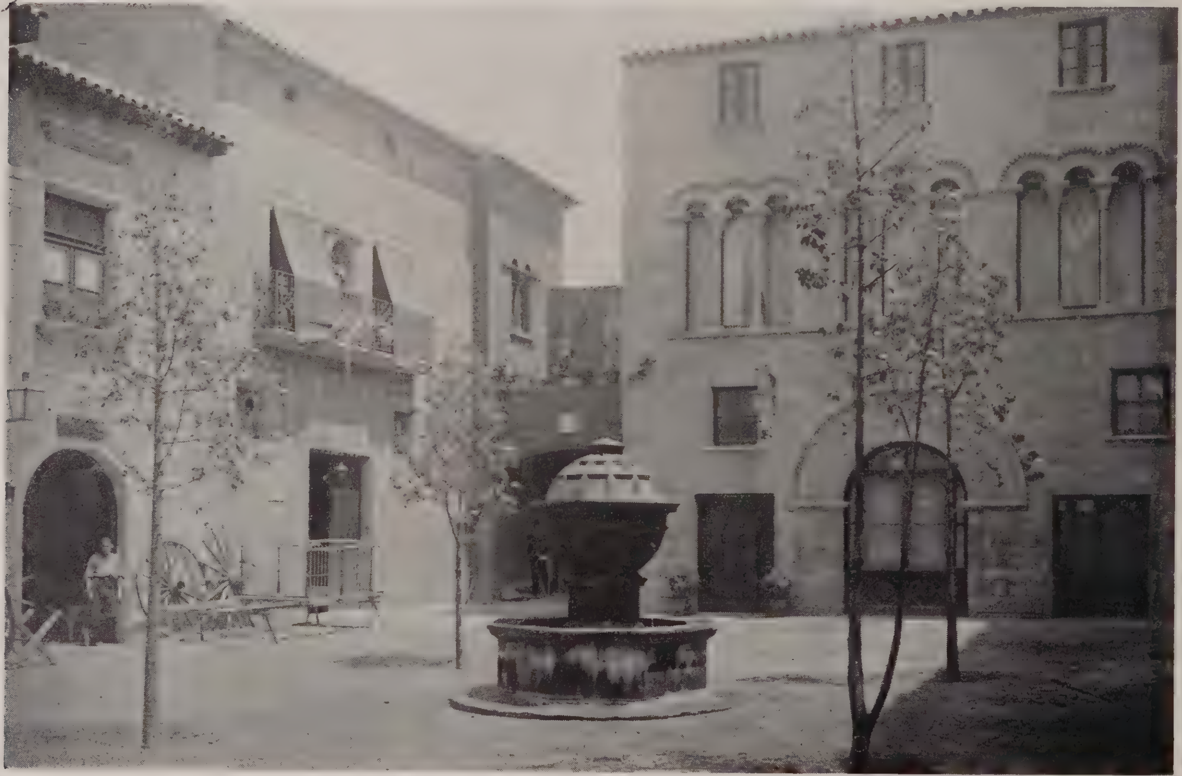


INTERIOR VIEW, PALACE OF DECORATIVE AND APPLIED ARTS, BARCELONA EXPOSITION
MANUEL PUIG AND D. M. CADES, ARCHITECTS

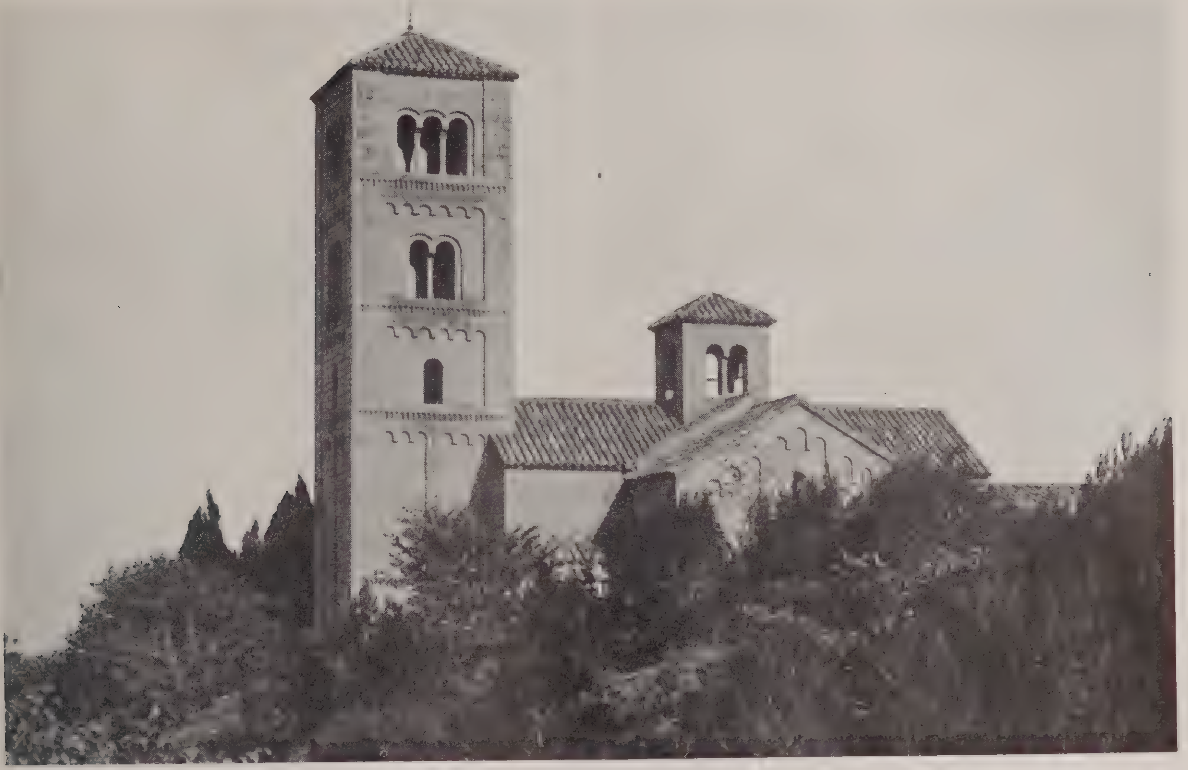


STREET SCENE IN SPANISH VILLAGE

BOSTON PUB LIBRARY



IN THE SPANISH VILLAGE, BARCELONA EXPOSITION



MONASTERY IN SPANISH VILLAGE

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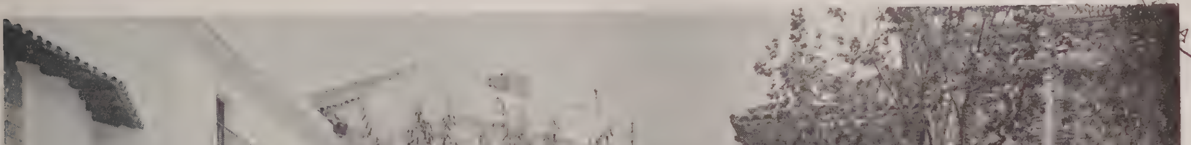
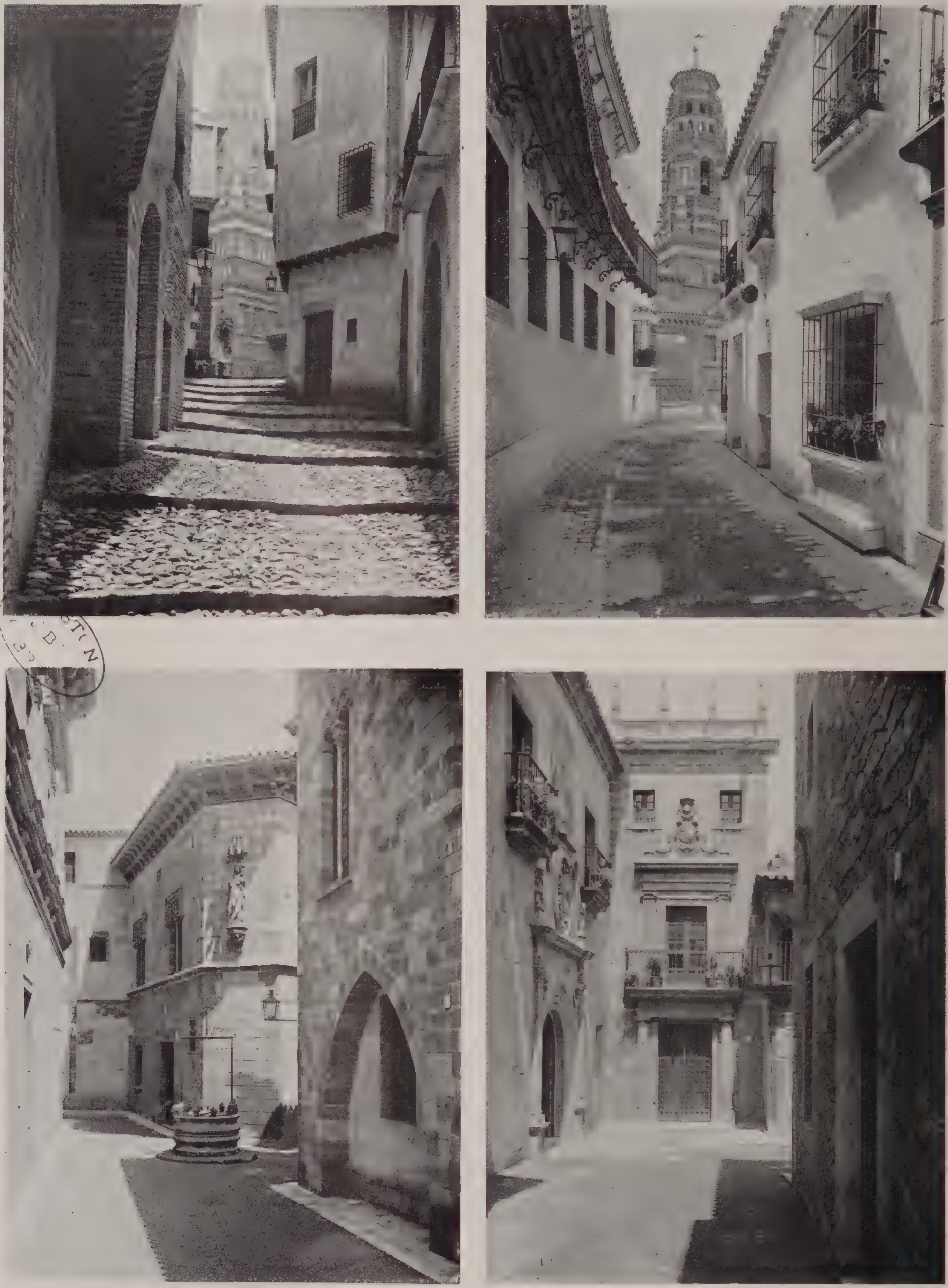
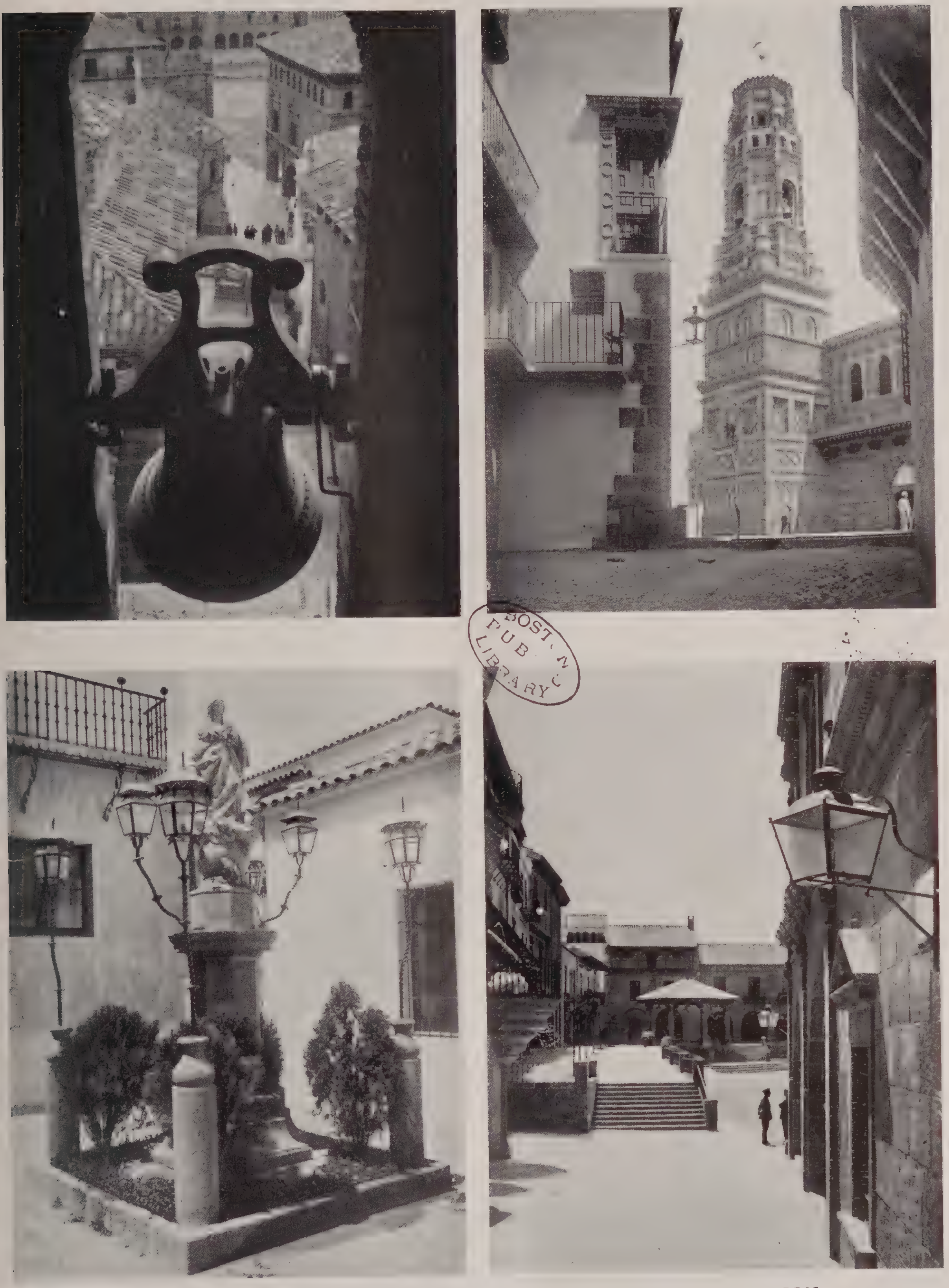


WALL FOUNTAIN, SPANISH VILLAGE, BARCELONA EXPOSITION



STREETS IN THE SPANISH VILLAGE, BARCELONA EXPOSITION



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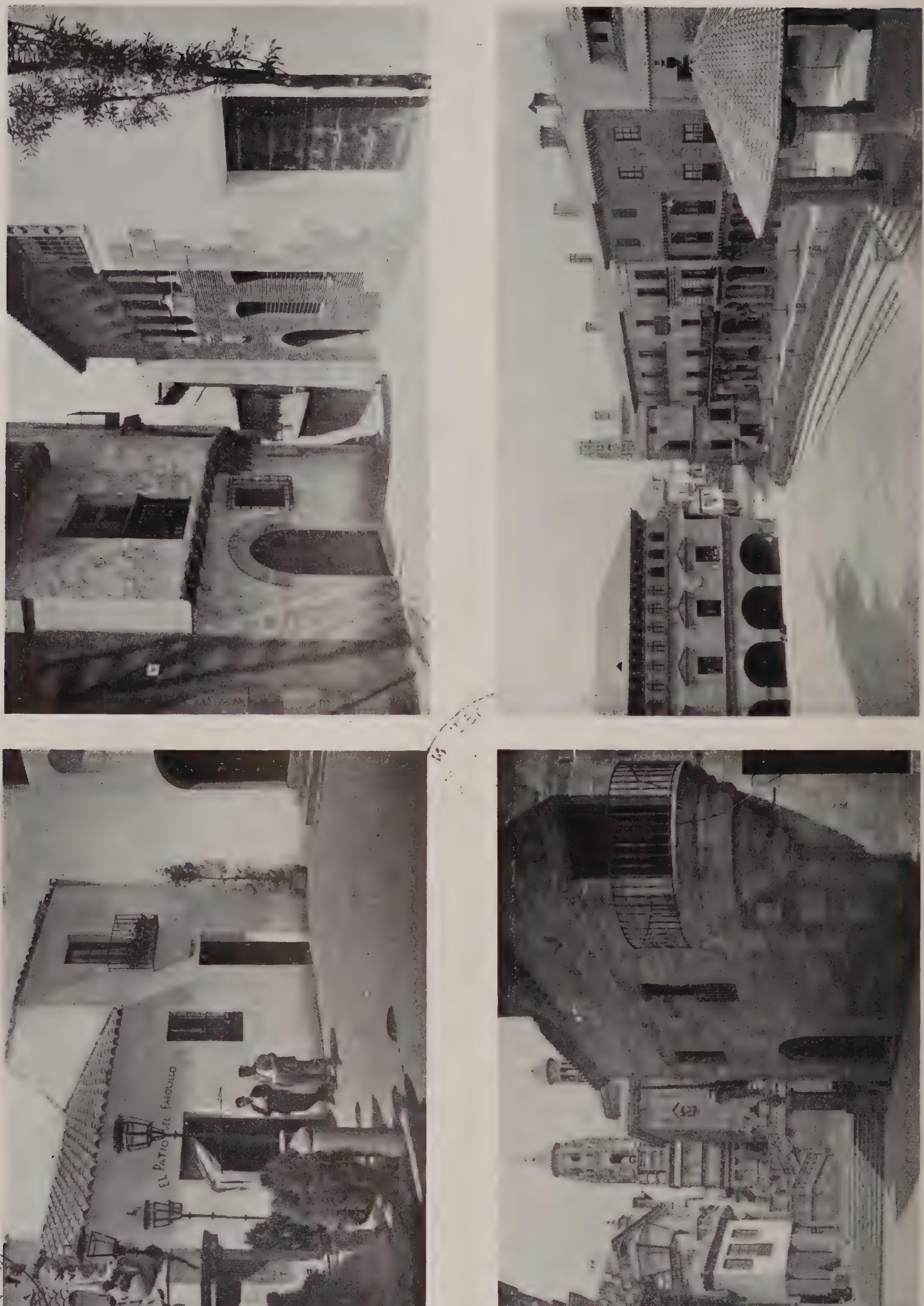
DETAILS FROM THE SPANISH VILLAGE, BARCELONA EXPOSITION



THE PLAZA AND SIDE STREETS, SPANISH VILLAGE, BARCELONA EXPOSITION

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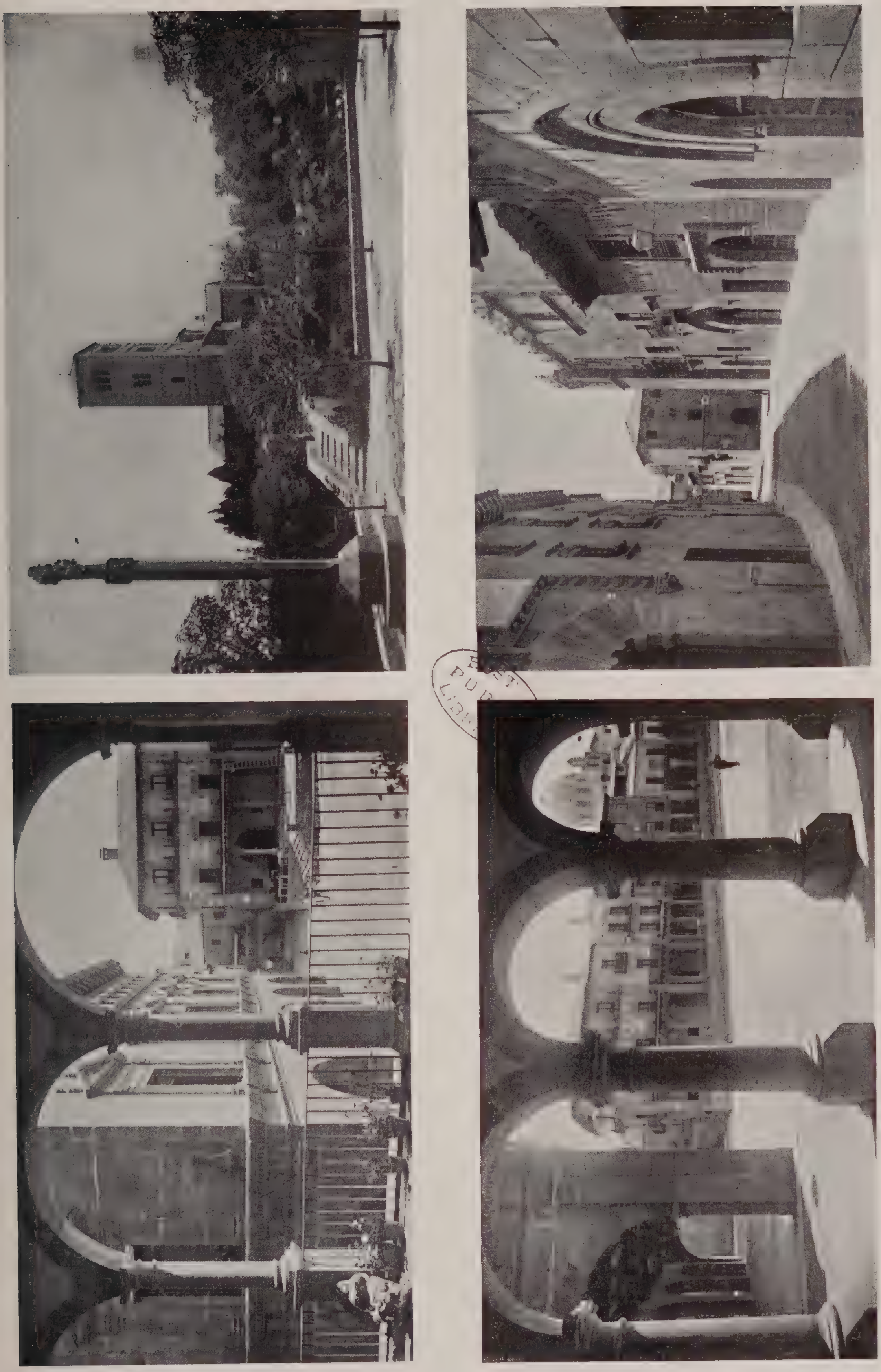


THE PLAZA AND ROMANESQUE MONASTERY, SPANISH VILLAGE, BARCELONA EXPOSITION

The Plaza of Fountains at Night, Barcelona Exposition

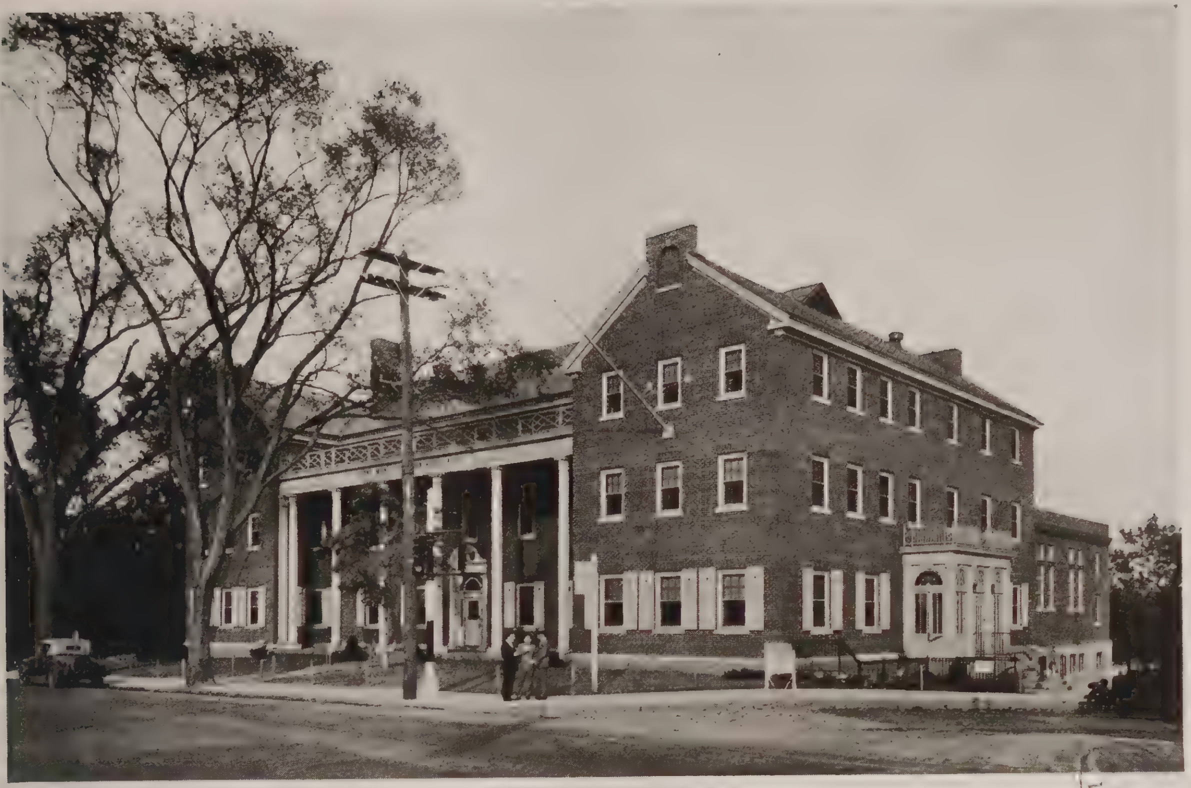
and D. E. Canosa, although here also a ready-made Spanish Renaissance cornice marks the roof line. Neither the Palace of Graphic Arts, nor the Palace of Industrial and Applied Arts by Manuel Puig and D. M. Cades, which blend the Renaissance and the Baroque, have anything to recommend them. The Pavilion of the City of Barcelona, by Jose Goday, on the other hand, has distinct personality, and its brick facade, ornamented with gilt bronze sculpture and with an upper loggia in perfect proportion with the symmetrical two-story division of the building, is pleasing.

Perfectly proper and decorously orthodox are the other minor buildings, all designed in obedience to tradition. Mention might be made of the Modern Art Building, which is anything but modern, and the Royal Pavilion, which is a greater success chromatically than architecturally.

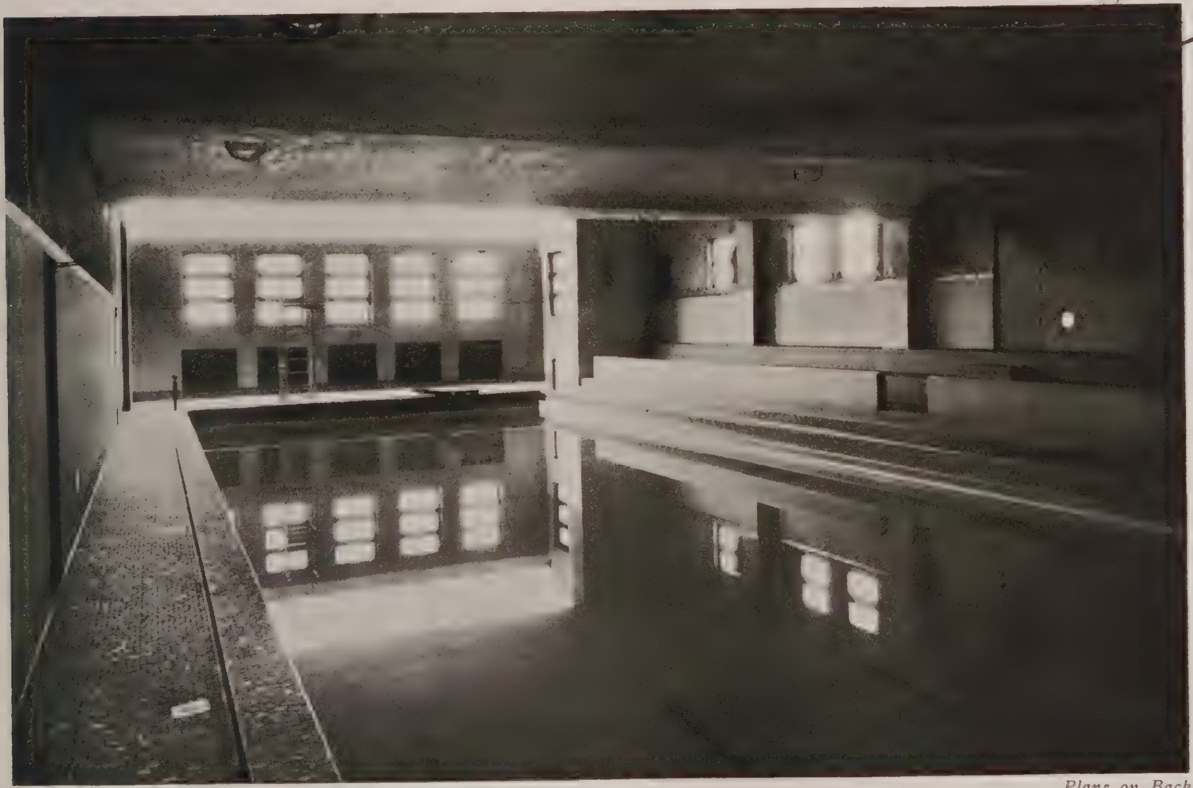
The coöperation of foreign nations has not been in keeping with the effort of Barcelona. Italy, Belgium, France, Germany, Denmark, Hungary, Norway, Rumania, Sweden, and Yugoslavia have buildings of sorts, but only Italy, Belgium and France have erected distinctive and consequential pavilions. France's pavilion is by Georges Wybo and is of "tempered modern" architecture. Italy's is more pretentious. It covers 4,500 square meters and is rich in marble and mosaic, while Belgium's, by the architect Verhelle, is pure Flemish of the time of the Spanish domination over Flanders. As for the United States, it is conspicuous by its absence. It seems that, being represented at Seville, it could not afford to be represented at Barcelona also. In consequence, the American firms who exhibit have their manufactures displayed in various and sundry buildings,—Agriculture, Machinery, Decorative Arts, etc.

No article on the Exposition would be complete that did not take into consideration one of the Exposition's "concessions," a private undertaking exacting an added admission tax, but embodying in a series of faithful reproductions, examples of Spain's most picturesque and most characteristic architecture. The visitor finds himself suddenly transported into some old quarter of Castile or Aragon, or else he walks up the tortuous steps of an Andalusian street to come upon a church tower of the purest Aragonese-Mudejar style, a copy of the campanile of Utebo, in the Province of Saragossa. Or else he will watch native dances in native costumes performed in a *plaza mayor,* typical of a thousand such to be found in every province of Spain, with its *Ayuntamiento* building, in this case a reproduction of the City Hall of Vallederobles in the Province of Teruel. There is a city gate, a copy on a smaller scale of the famous Puerta de San Vincente of Avila, and the entire 20,000 square meters area of the "village" is enclosed by an ancient city wall. Along the streets, facing the square are typical shops, inns and dwellings, inhabited by supposedly authentic citizens of the particular provinces pictorialized, who are serving native dishes in native costumes and singing local and regional songs and selling local and regional products.

The directing hand and eye which selected the various architectural units to be reproduced are to be congratulated not only on the choice made, but in the skill shown in assembling them with never any apparent anachronism. When one is within the walls of the Spanish *pueblo,* one is in old Spain, completely untouched by progress.



GENERAL VIEW



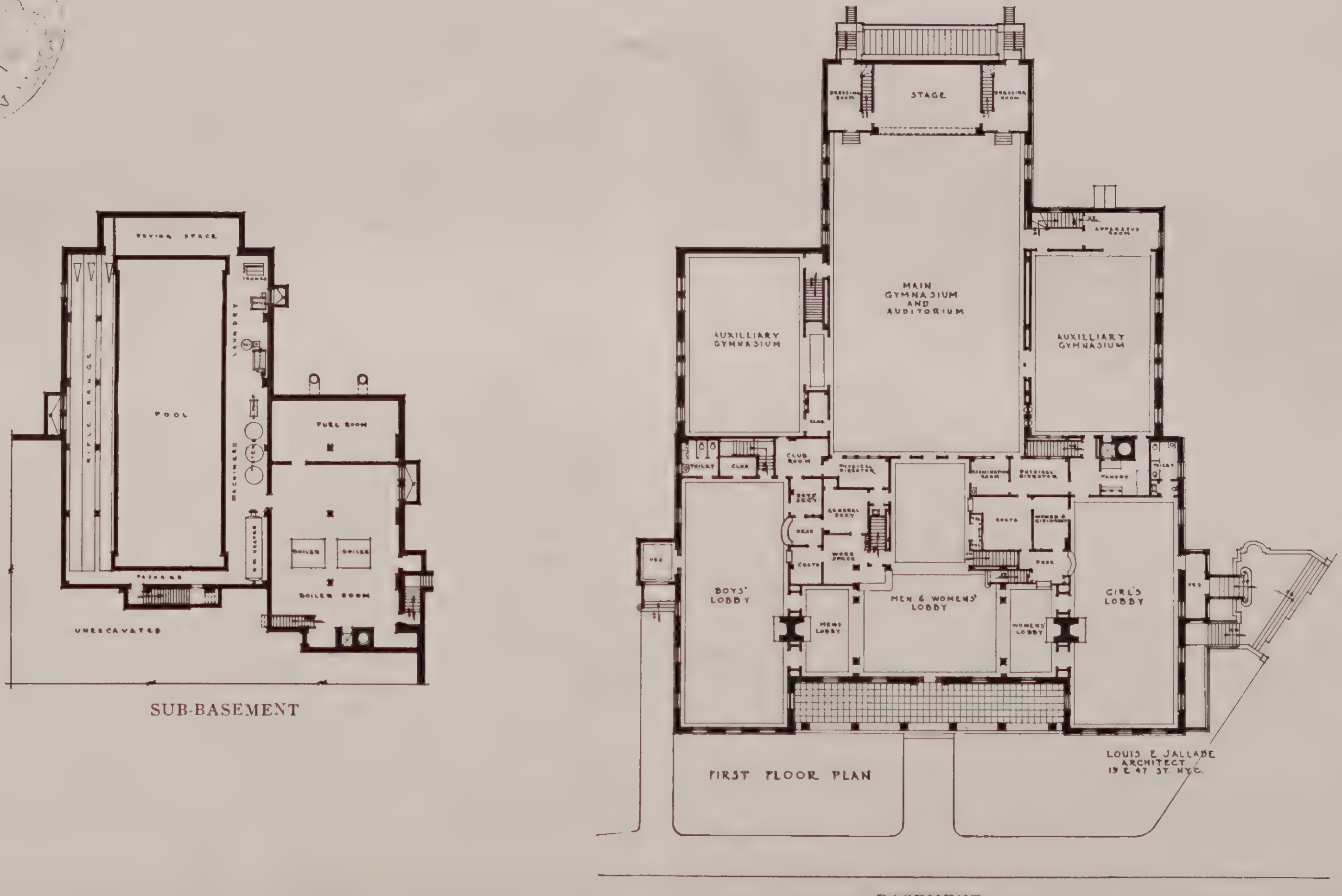
Photos. Barlow

Plans on Back

SWIMMING POOL

YOUNG MEN'S CHRISTIAN ASSOCIATION BUILDING, HACKENSACK, N. J.

LOUIS E. JALLADE, ARCHITECT

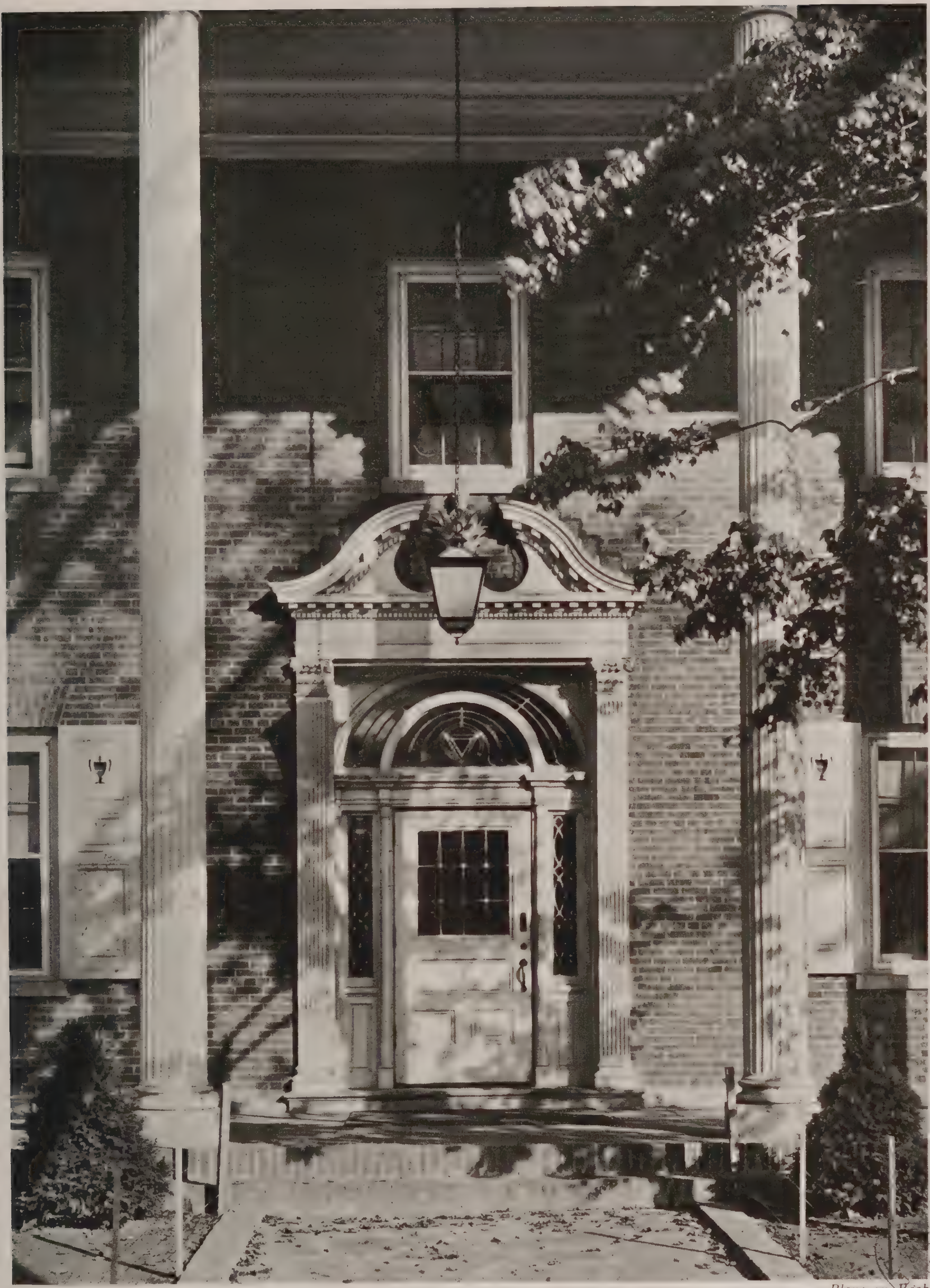


SUB-BASEMENT

BASEMENT

PLANS. YOUNG MEN'S CHRISTIAN ASSOCIATION BUILDING, HACKENSACK, N. J.

LOUIS E. JALLADE, ARCHITECT



Plans on Back

MAIN ENTRANCE
YOUNG MEN'S CHRISTIAN ASSOCIATION BUILDING, HACKENSACK, N. J.
LOUIS E. JALLADE, ARCHITECT

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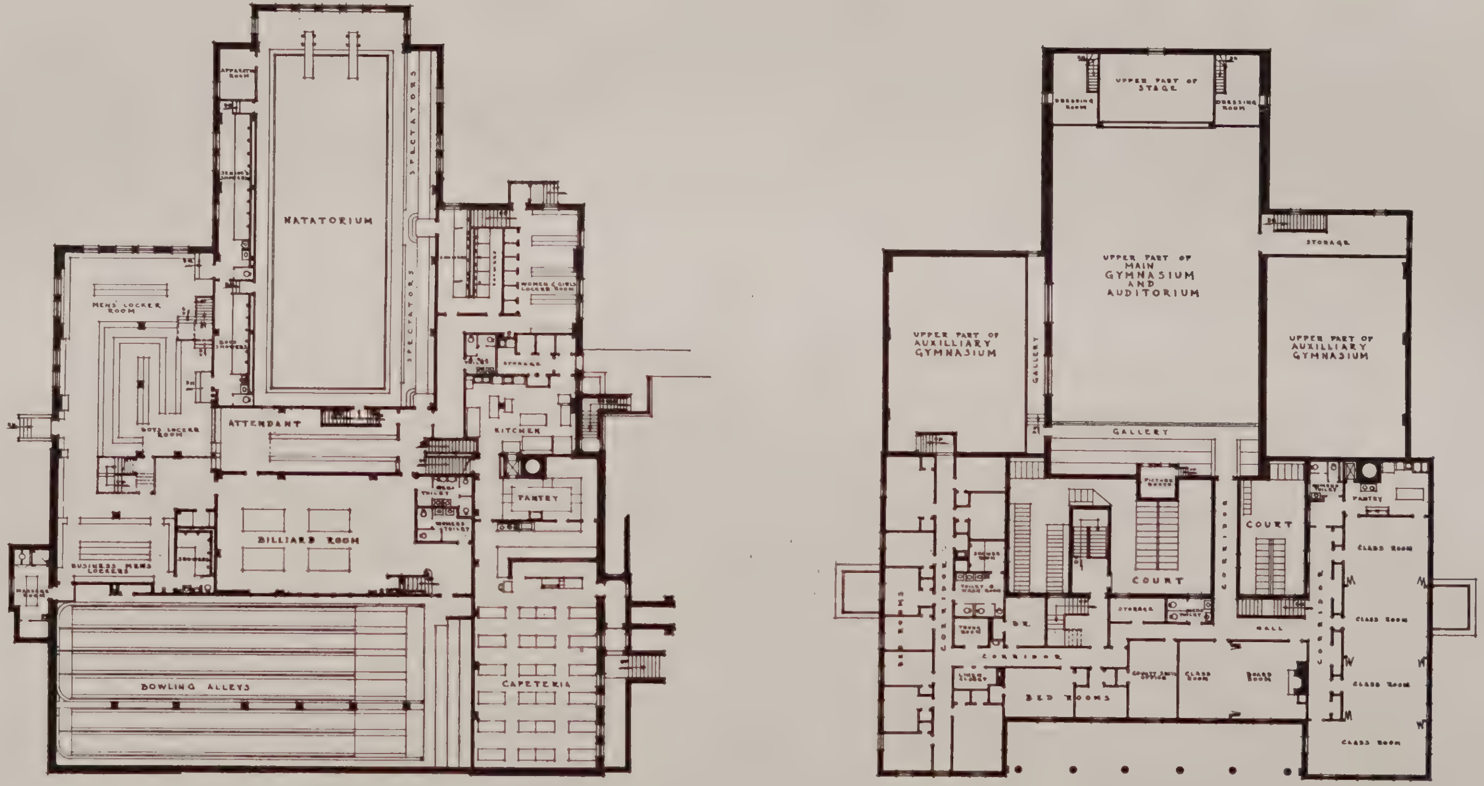
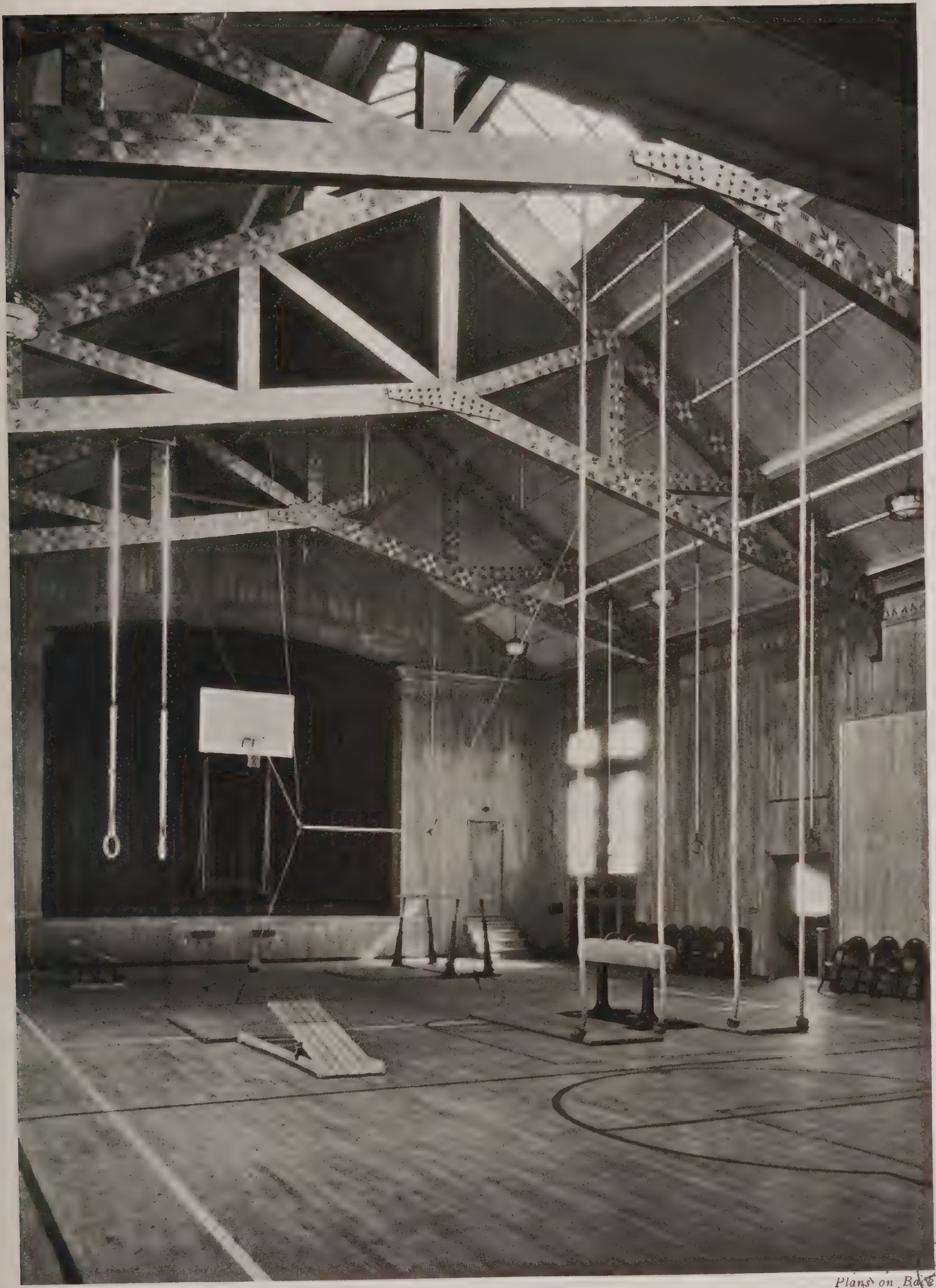


FIRST FLOOR

SECOND FLOOR

PLANS. YOUNG MEN'S CHRISTIAN ASSOCIATION BUILDING, HACKENSACK, N. J.
LOUIS E. JALLADE, ARCHITECT



Plans on Back

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GYMNASIUM
YOUNG MEN'S CHRISTIAN ASSOCIATION BUILDING, HACKENSACK, N. J.
LOUIS E. JALLADE, ARCHITECT

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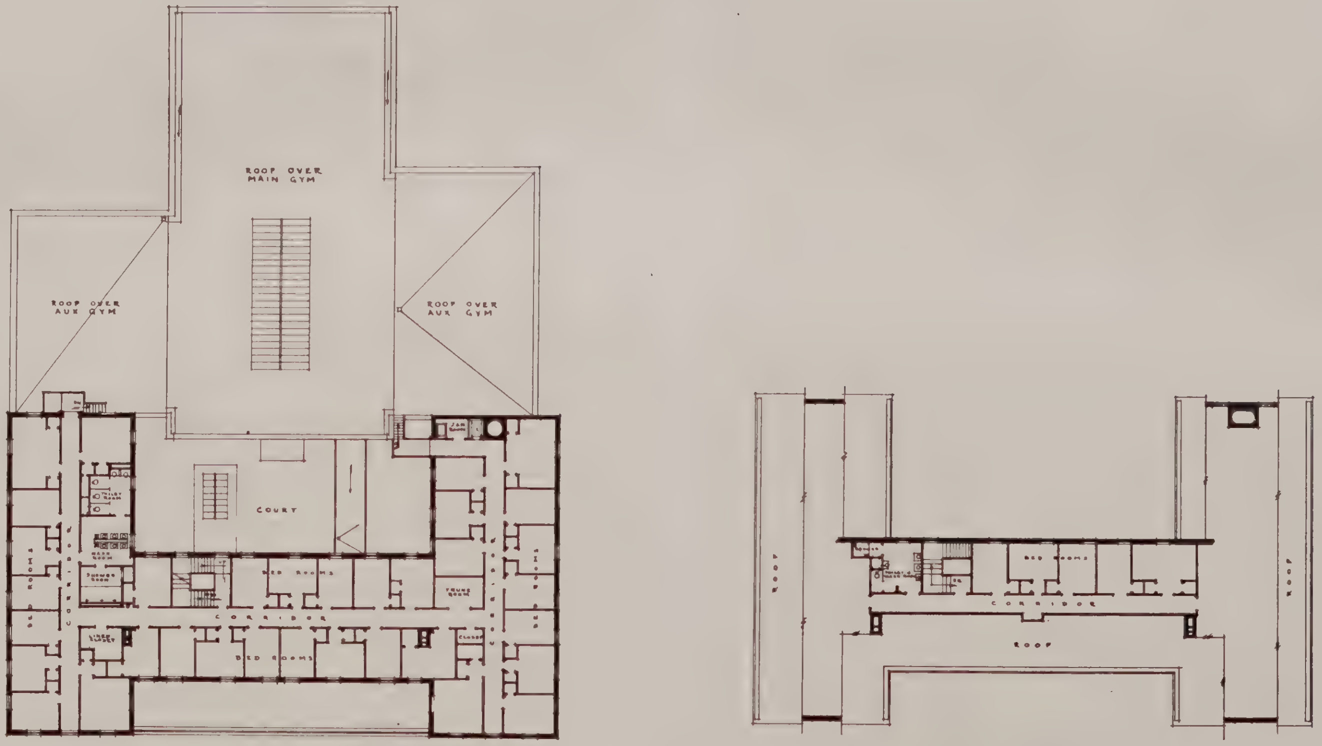
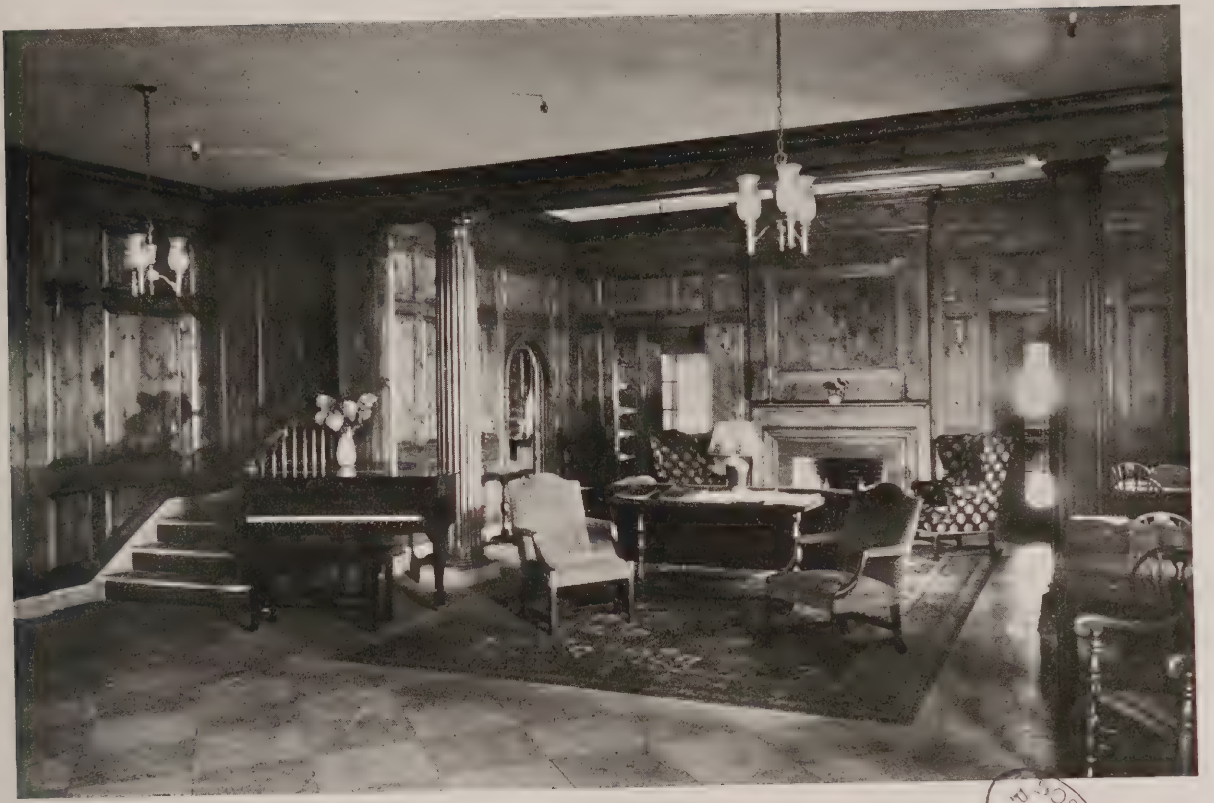


THIRD FLOOR

FOURTH FLOOR

PLANS. YOUNG MEN'S CHRISTIAN ASSOCIATION BUILDING, HACKENSACK, N. J.
LOUIS E. JALLADE, ARCHITECT



WOMEN'S LOBBY

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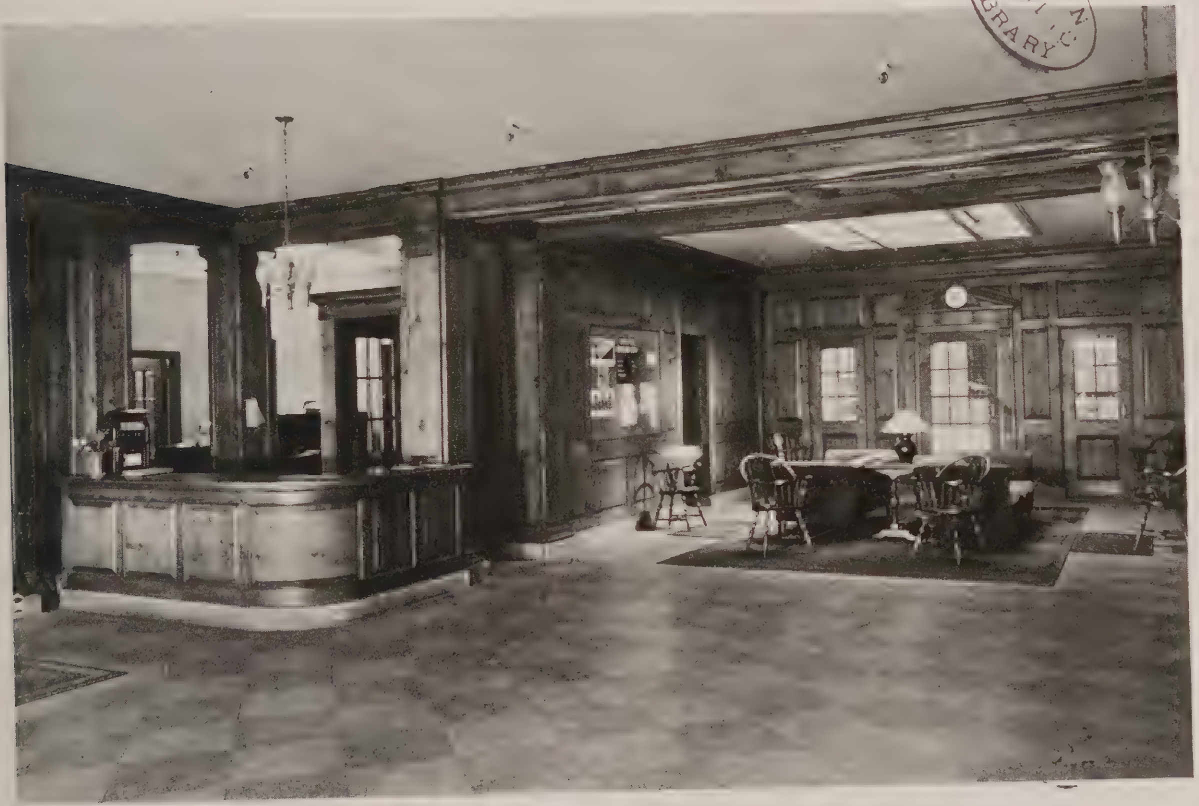
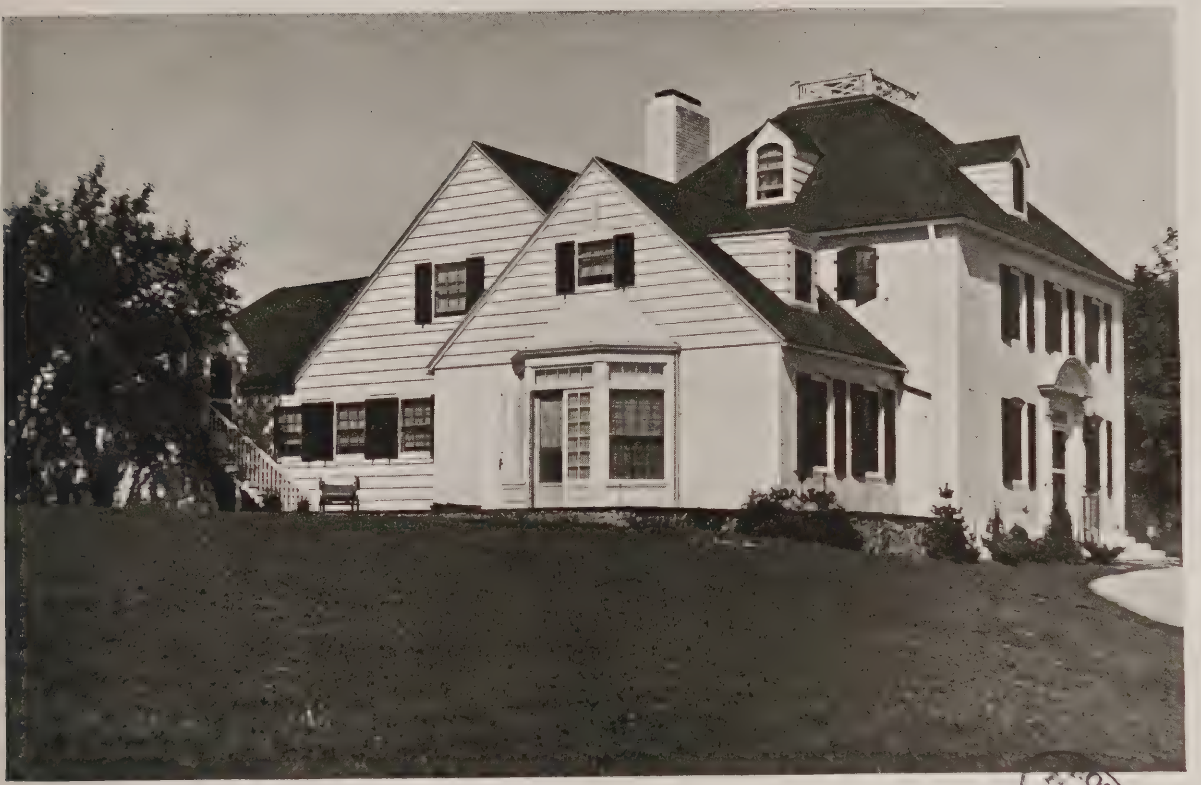


MAIN LOBBY

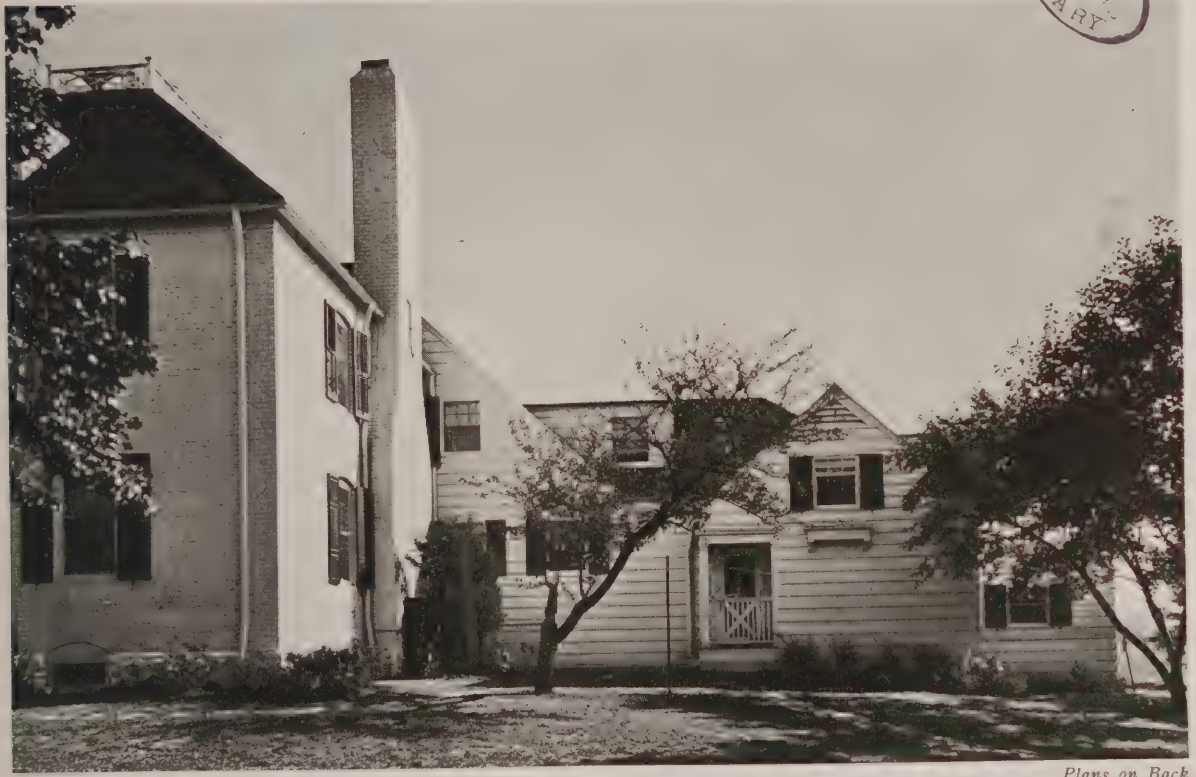
YOUNG MEN'S CHRISTIAN ASSOCIATION BUILDING, HACKENSACK, N. J.

LOUIS E. JALLADE, ARCHITECT



VIEW FROM THE SOUTHWEST

LIBRARY



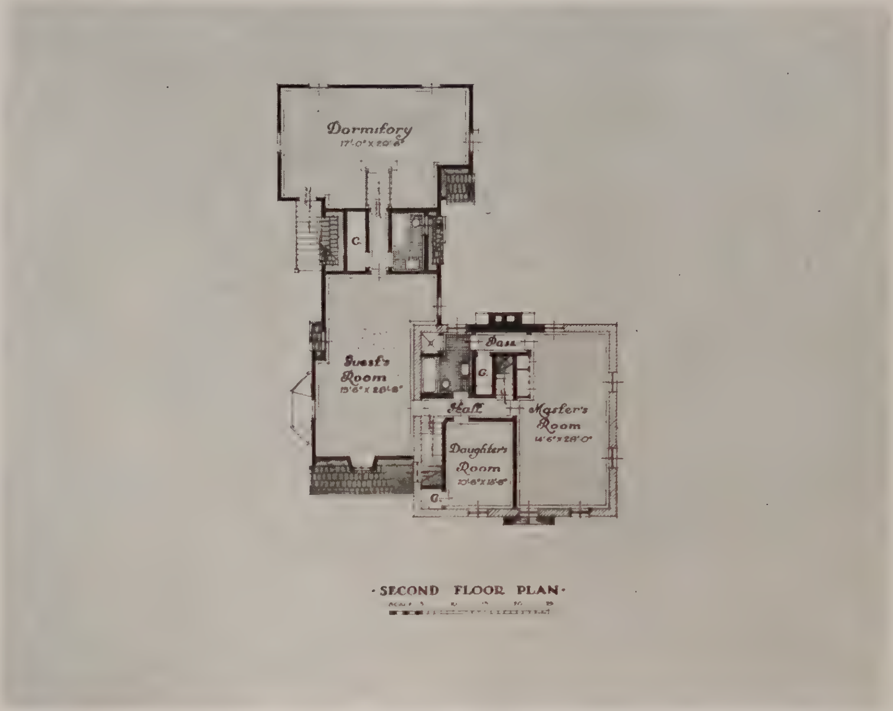
Photos. Trowbridge

Plans on Back

SERVICE WING

ALTERATIONS TO THE HOUSE OF FRANK L. BATEMAN, ESQ., BARRINGTON, ILL.

HUSZAGH & HILL, ARCHITECTS



SECOND FLOOR

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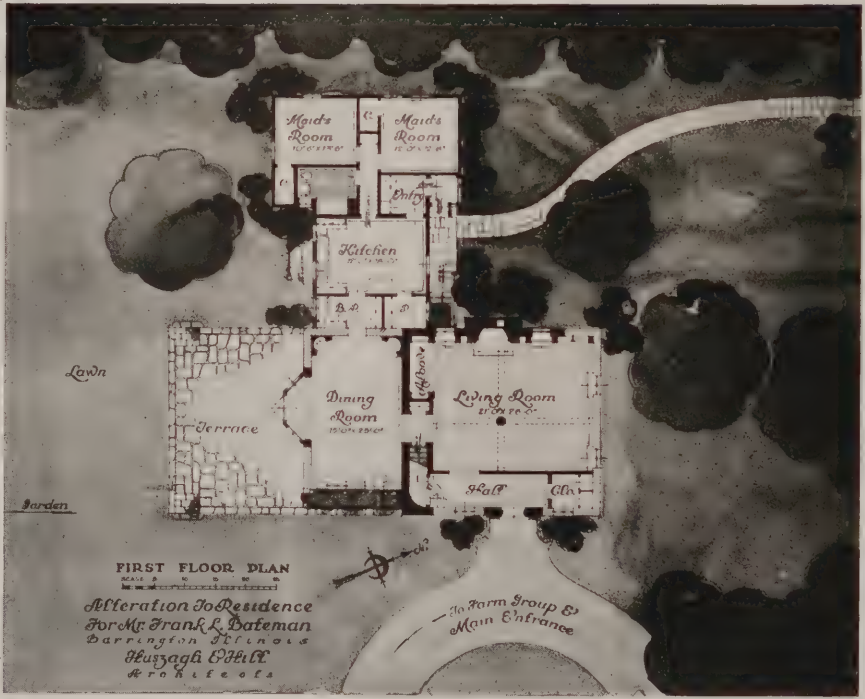
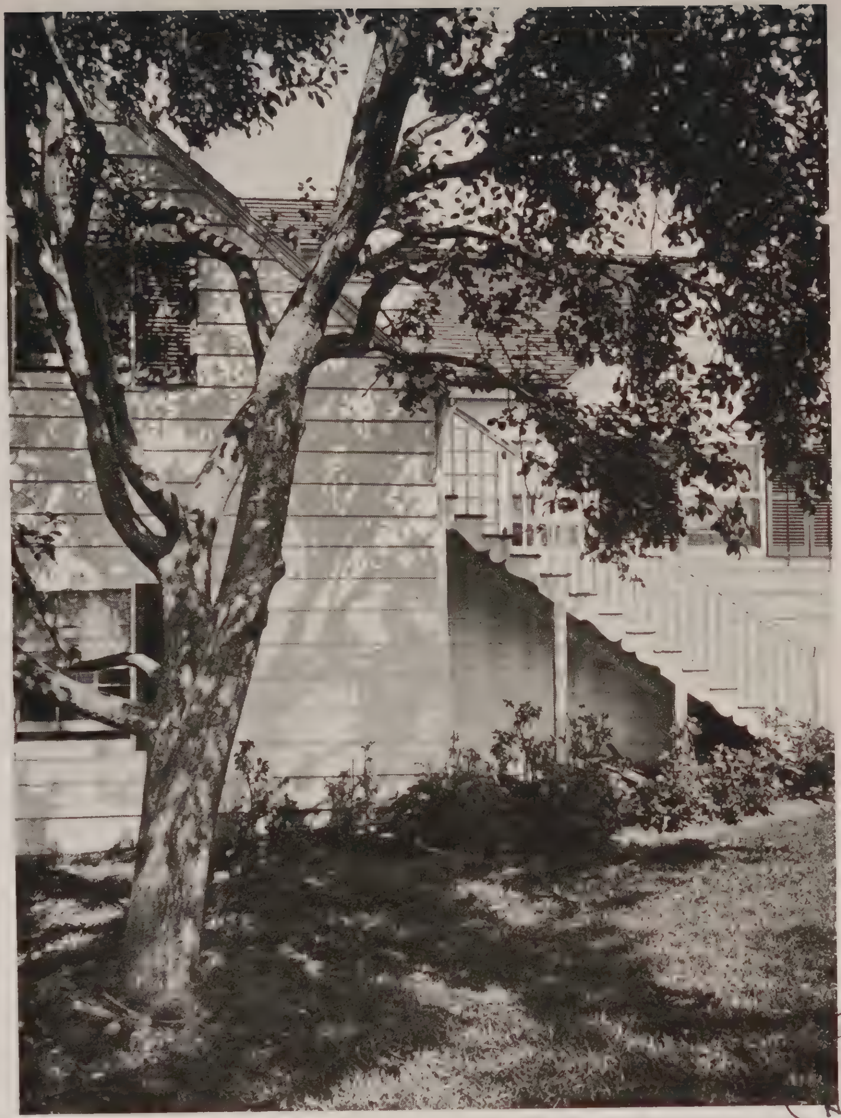
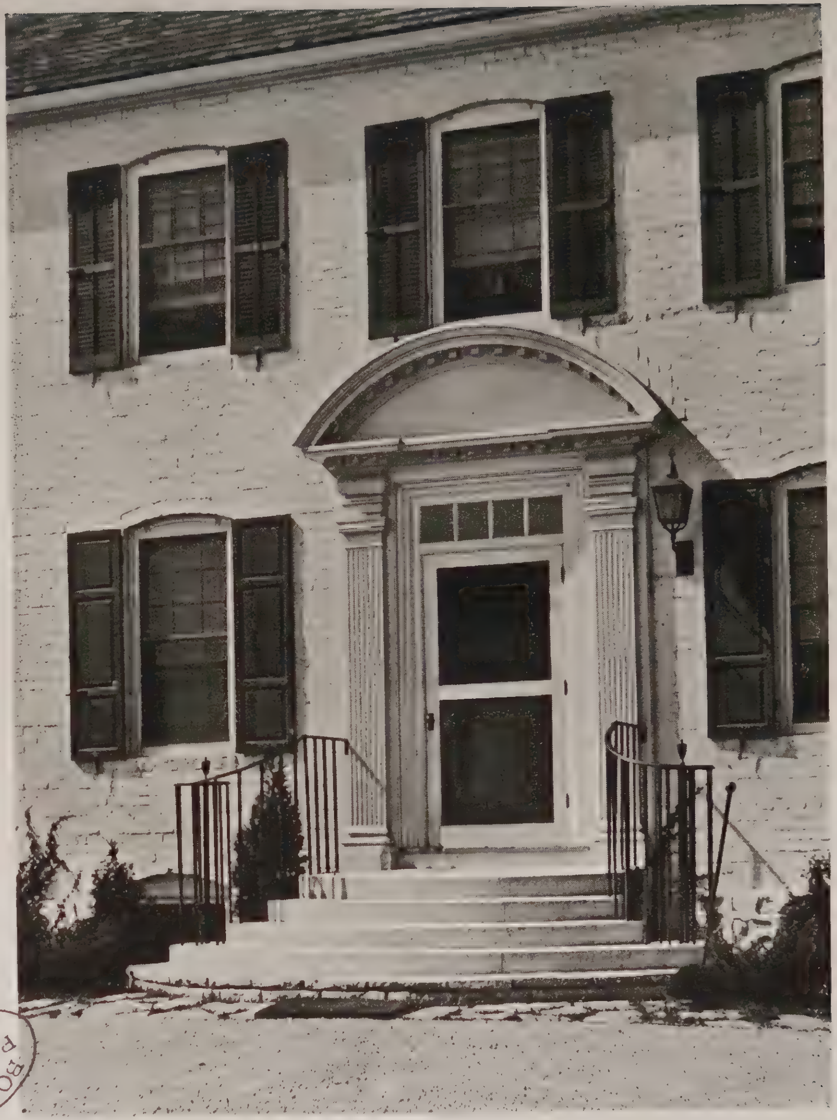


FIRST FLOOR

PLANS. ALTERATIONS TO HOUSE OF FRANK L. BATEMAN, ESQ., BARRINGTON, ILL.
HUSZAGH & HILL, ARCHITECTS



STAIR TO SERVANTS' DORMITORY

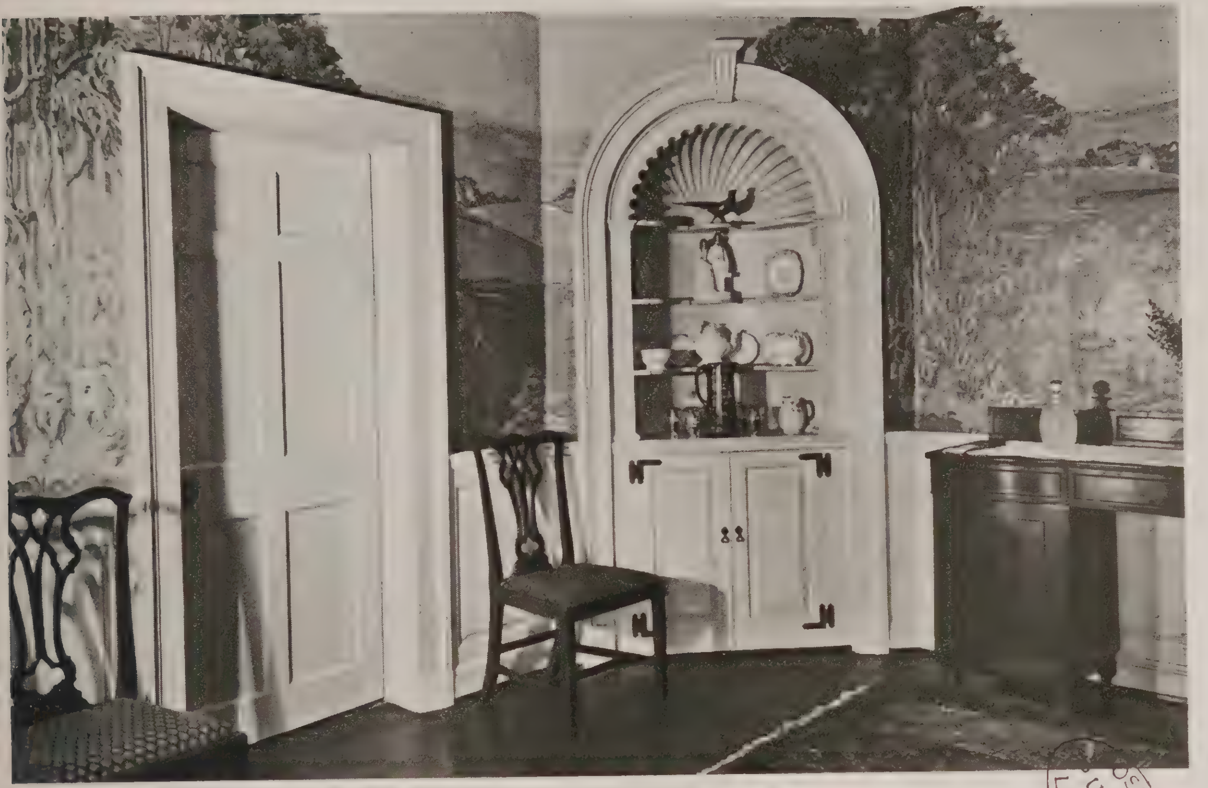


MAIN ENTRANCE DOOR

BOSTON PUB LIB

ALTERATIONS TO THE HOUSE OF FRANK L. BATEMAN, ESQ., BARRINGTON, ILL.

HUSZAGH & HILL, ARCHITECTS



CORNER OF DINING ROOM

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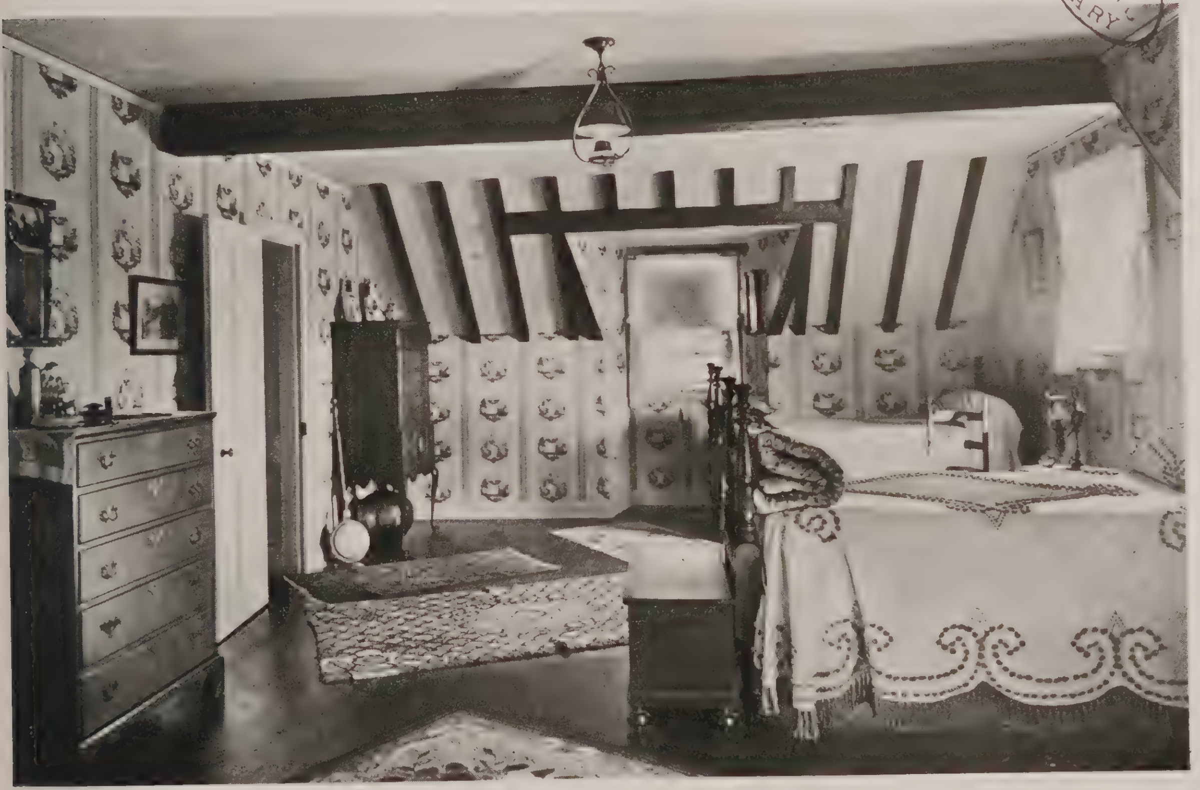
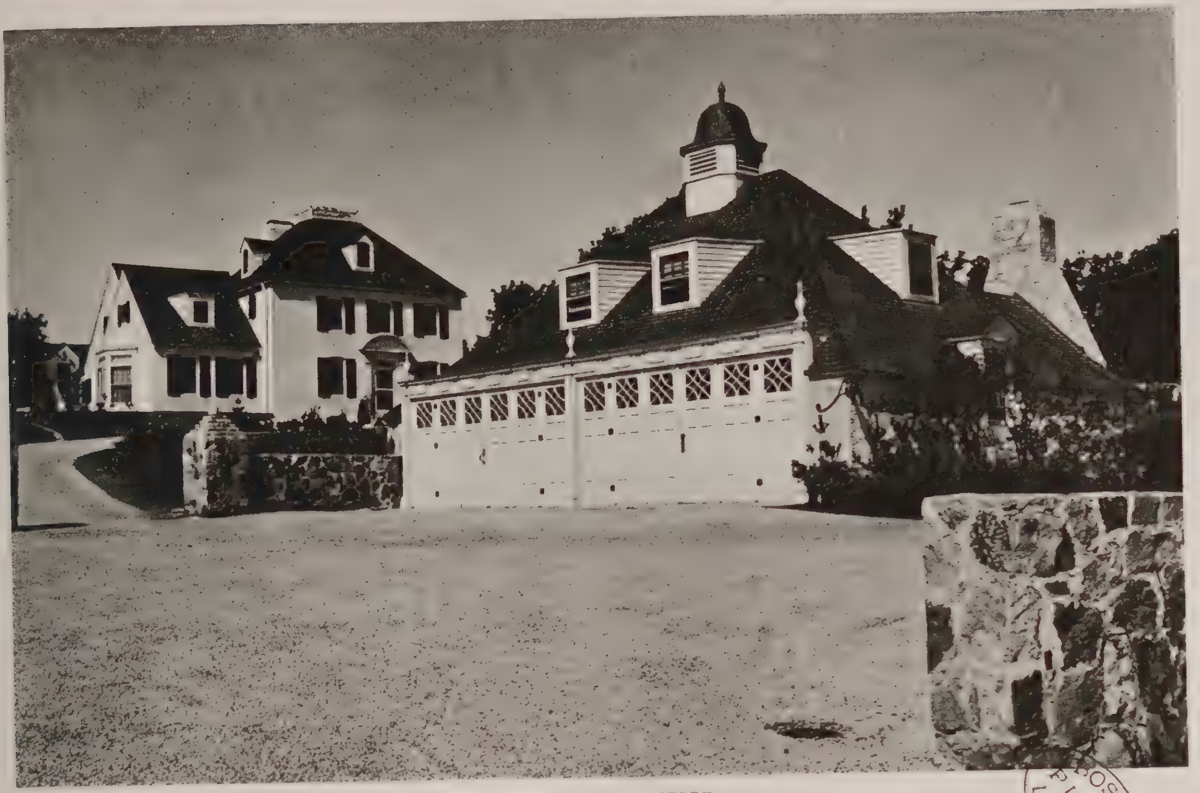


GUEST ROOM

ALTERATIONS TO THE HOUSE OF FRANK L. BATEMAN, ESQ., BARRINGTON, ILL.

HUSZAGH & HILL, ARCHITECTS



GARAGE AND OFFICE
ESTATE OF FRANK L. BATEMAN, ESQ., BARRINGTON, ILL.
HUSZAGH & HILL, ARCHITECTS

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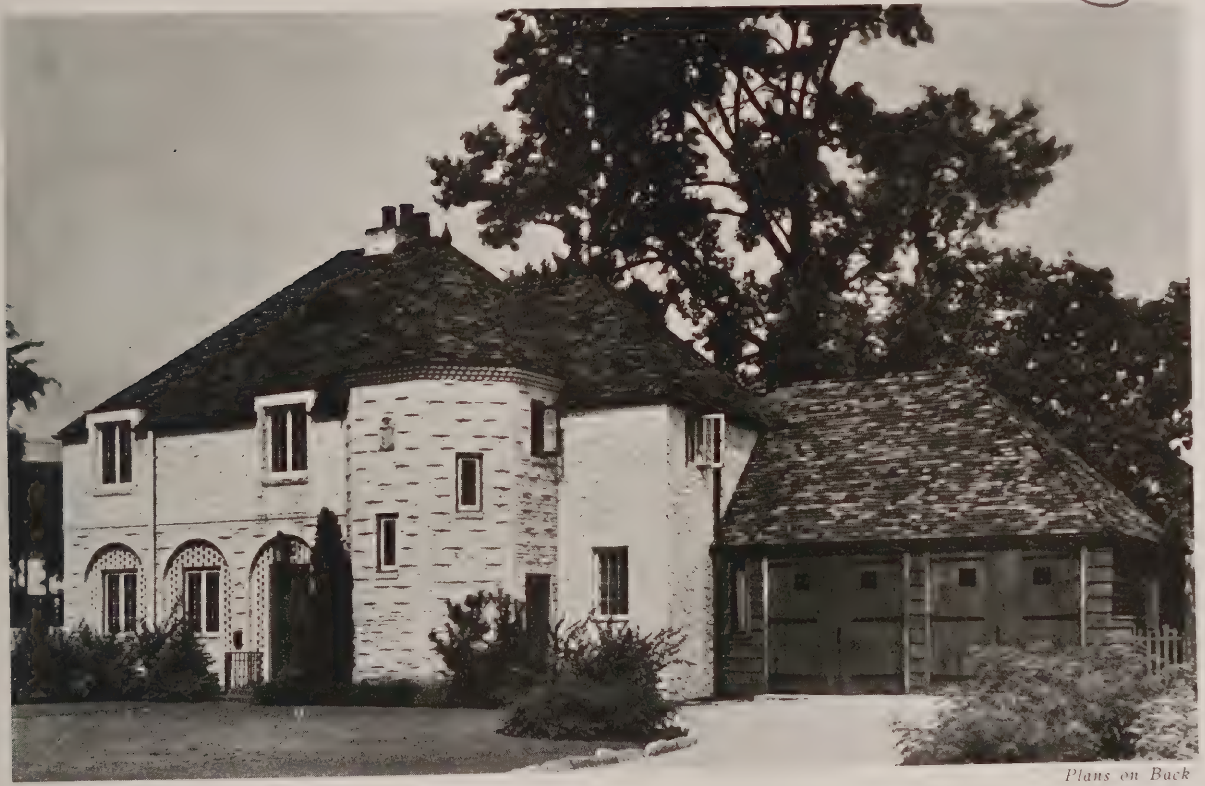
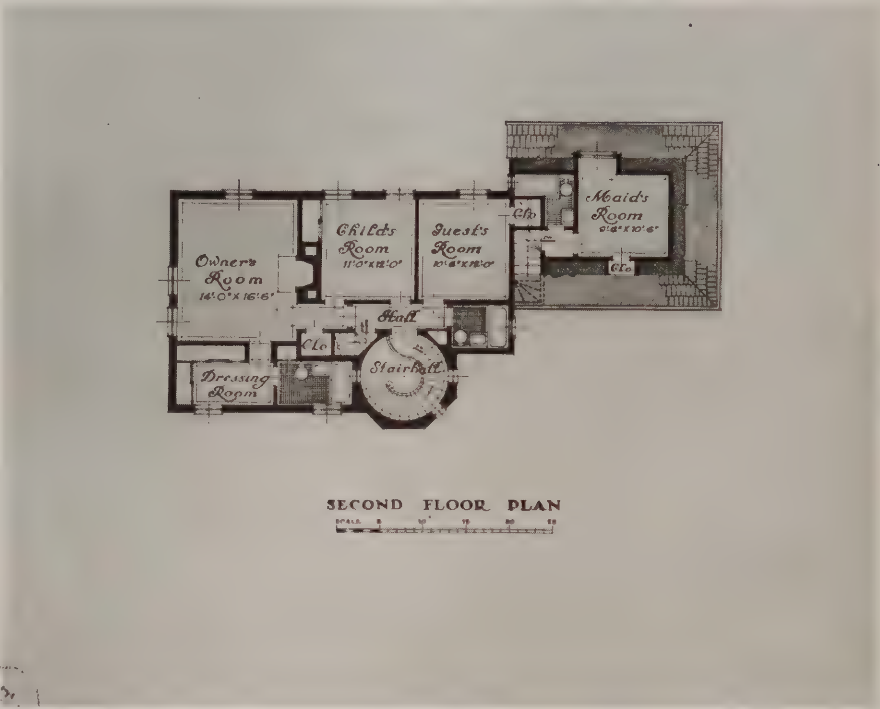


Photos. Trowbridge

Plans on Back

HOUSE OF RALPH D. HUSZAGH, ESQ., WINNETKA, ILL.
HUSZAGH & HILL, ARCHITECTS



SECOND FLOOR

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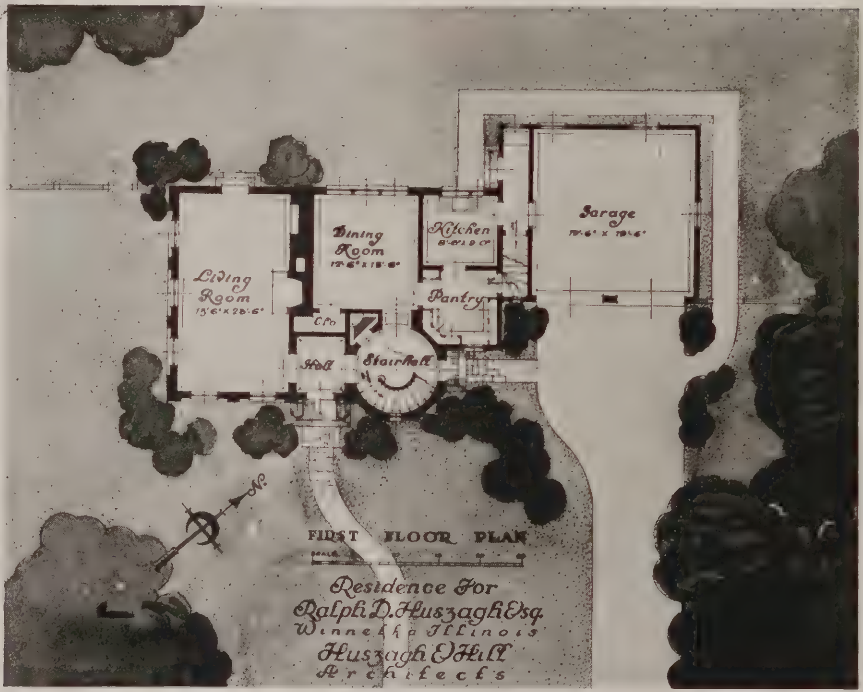

FIRST FLOOR

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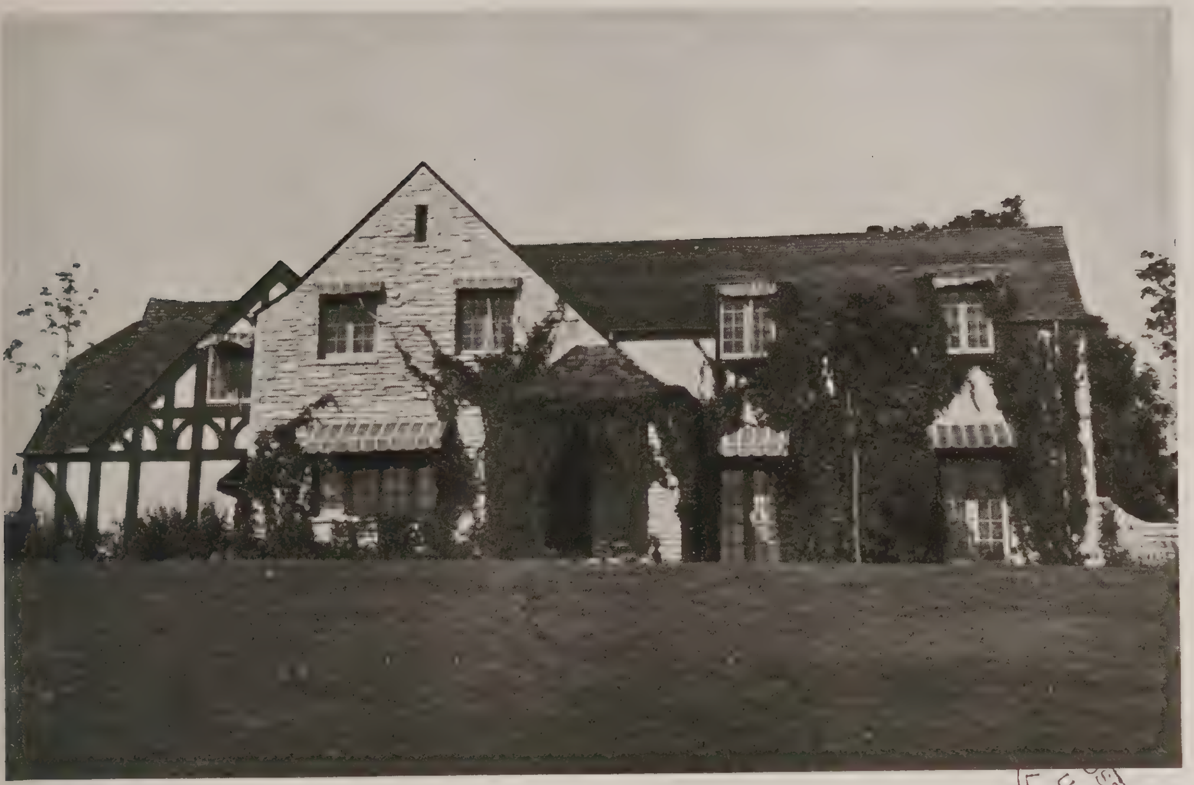
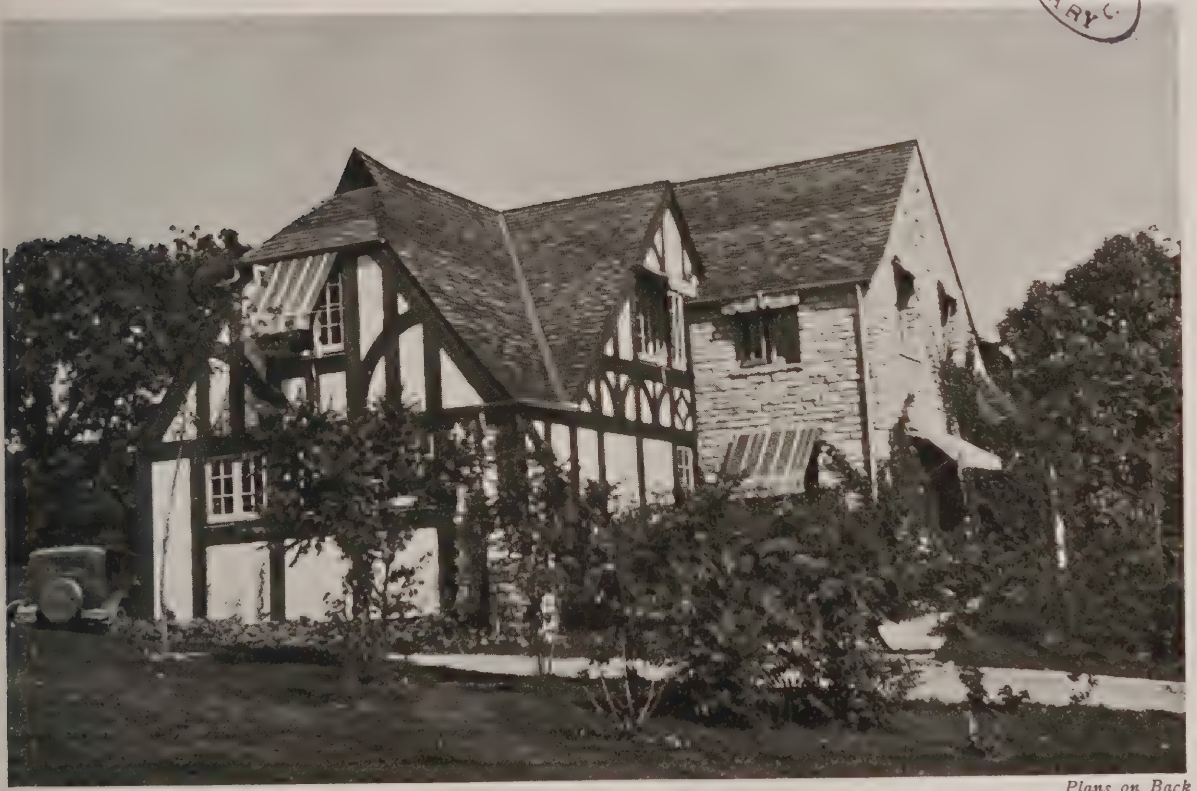
PLANS. HOUSE OF RALPH D. HUSZAGH, ESQ., WINNETKA, ILL.
HUSZAGH & HILL, ARCHITECTS



FRONT ELEVATION

LIBRARY



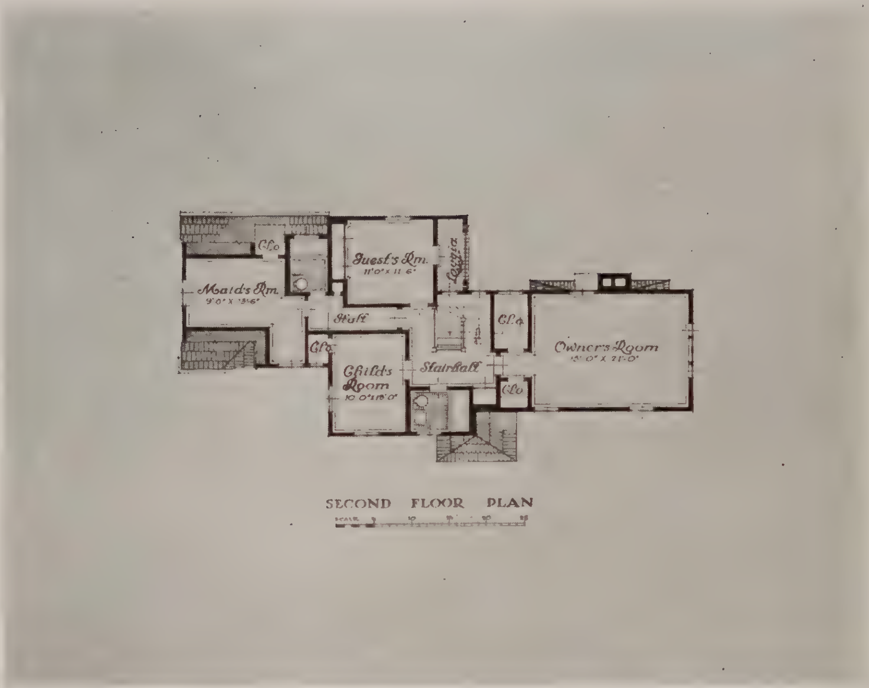
Photos. Trowbridge

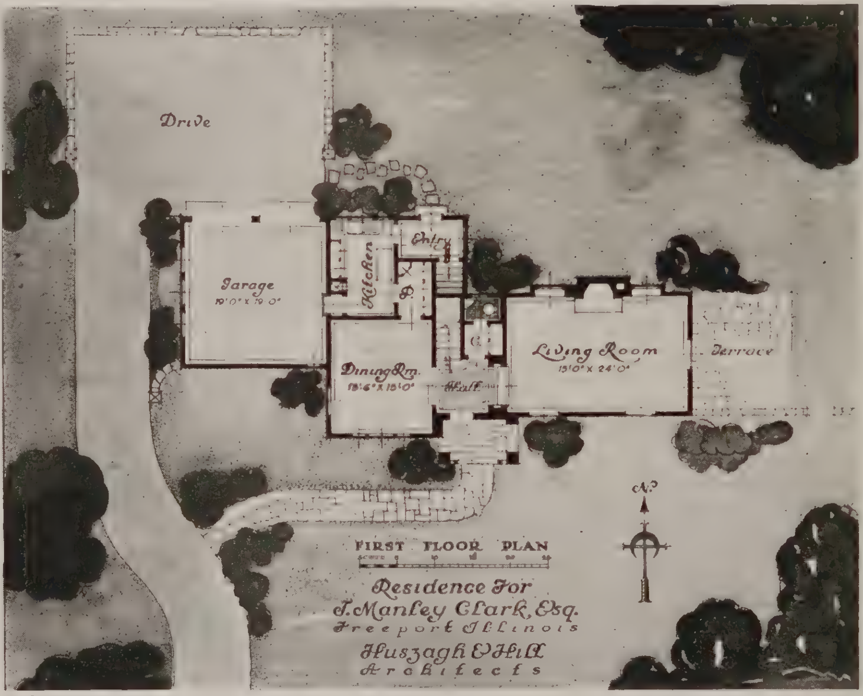
Plans on Back

GARAGE WING

HOUSE OF J. MANLEY CLARK, ESQ., FREEPORT, ILL.

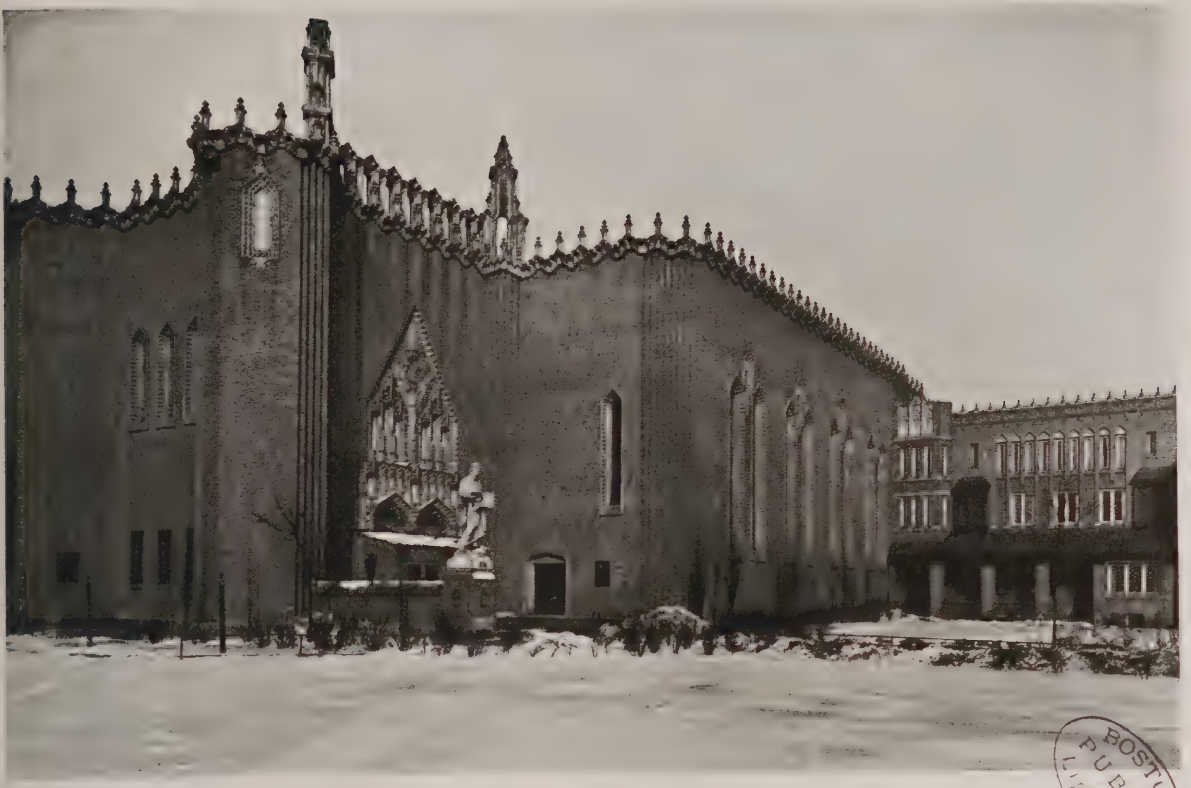
HUSZAGH & HILL, ARCHITECTS





BOSTON PUBLIC LIBRARY

PLANS. HOUSE OF J. MANLEY CLARK, ESQ., FREEPORT, ILL.
HUSZAGH & HILL, ARCHITECTS



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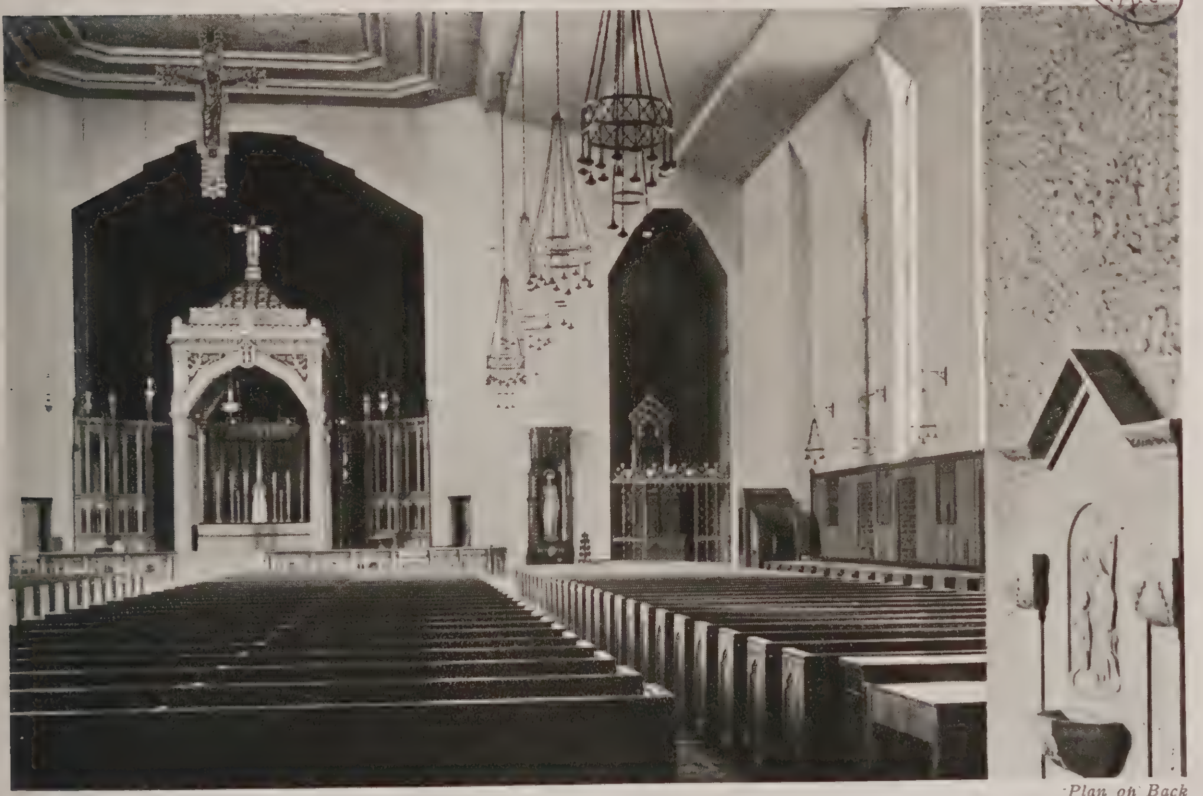
GENERAL VIEW



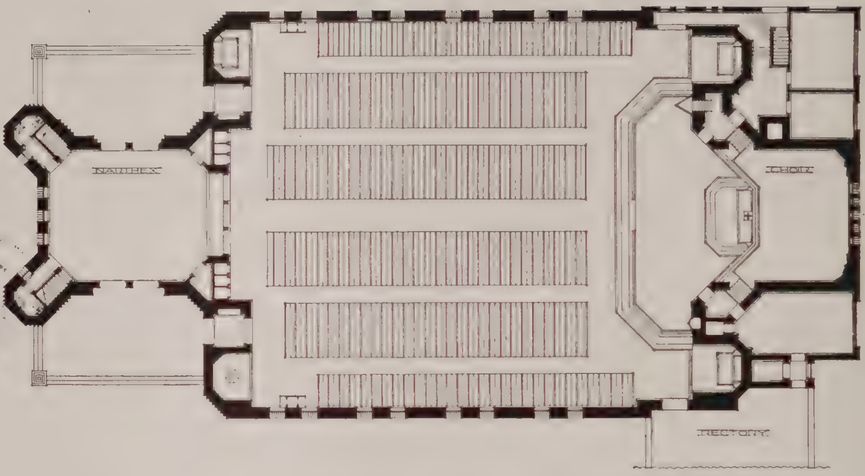
Photos. Trowbridge

Plan on Back

SANCTUARY AND SIDE CHAPEL

CHURCH OF ST. THOMAS THE APOSTLE, CHICAGO

BARRY BYRNE, ARCHITECT



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PLAN. CHURCH OF ST. THOMAS THE APOSTLE, CHICAGO
BARRY BYRNE, ARCHITECT

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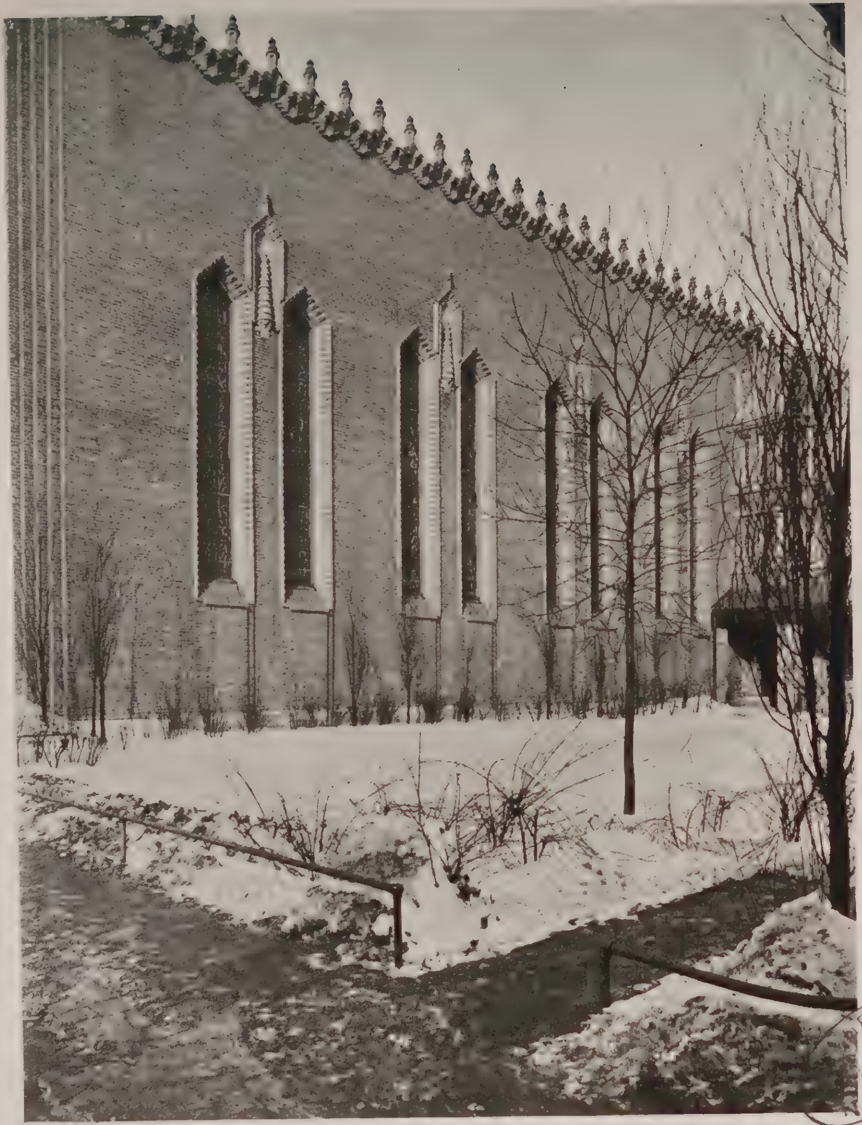
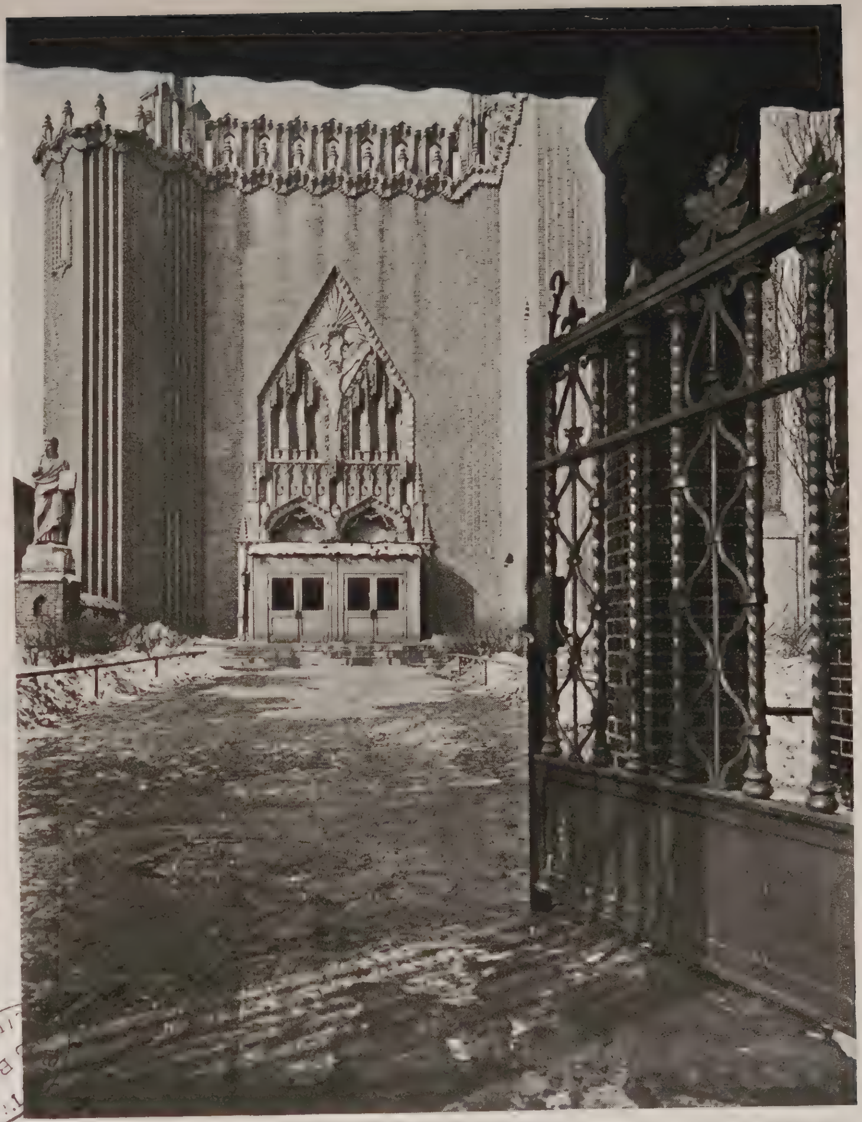


SOUTH ELEVATION



ENTRANCE TO NARTHEX

CHURCH OF ST. THOMAS THE APOSTLE, CHICAGO

BARRY BYRNE, ARCHITECT

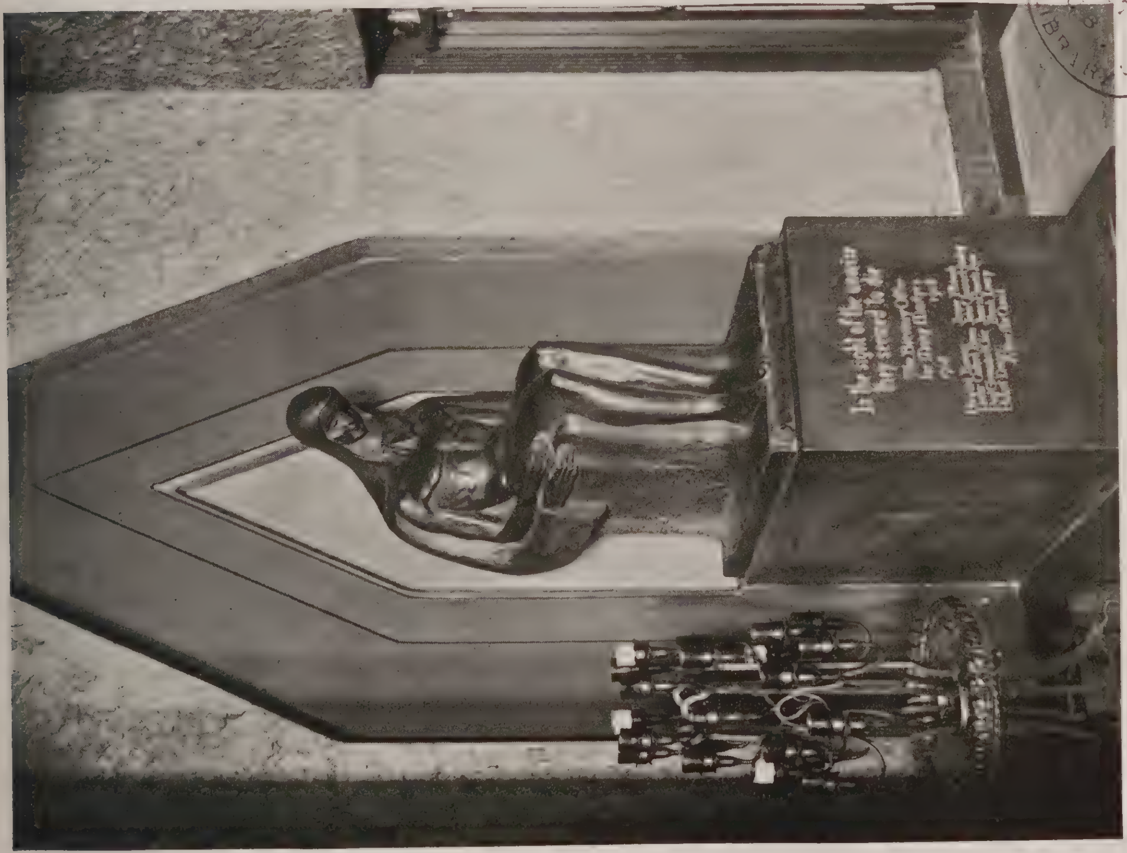
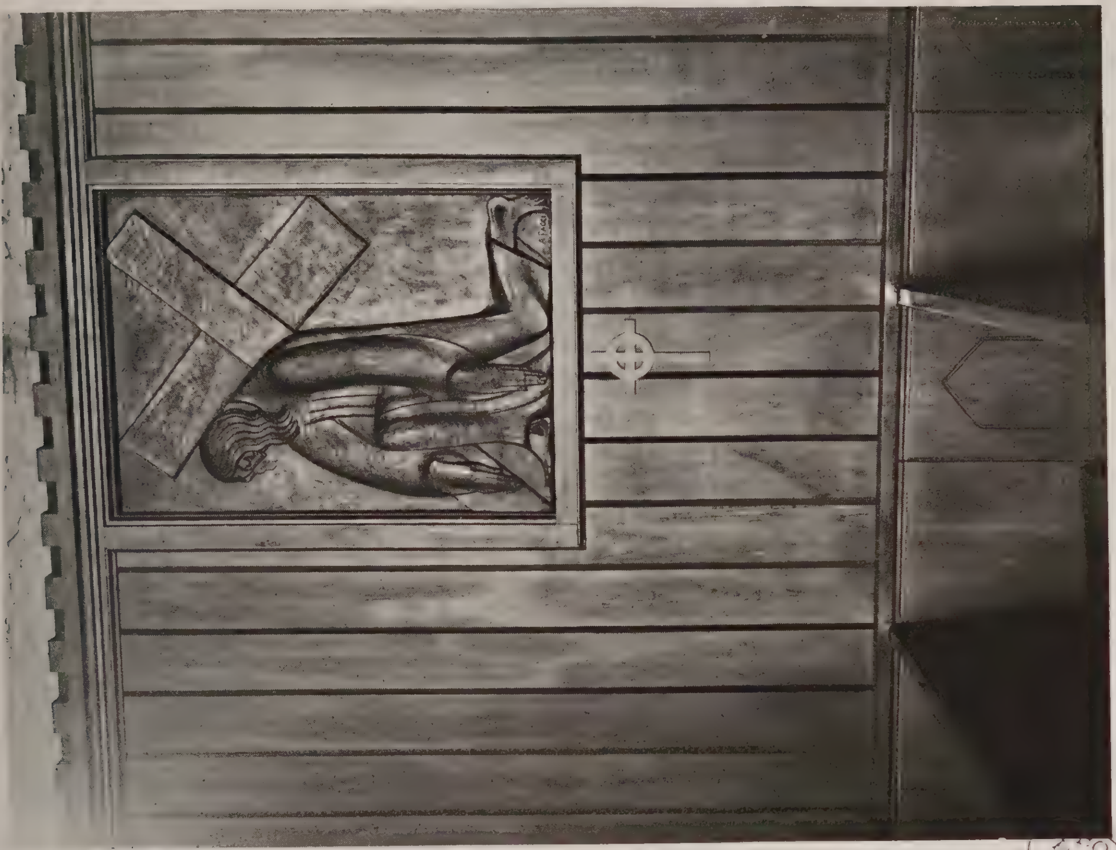


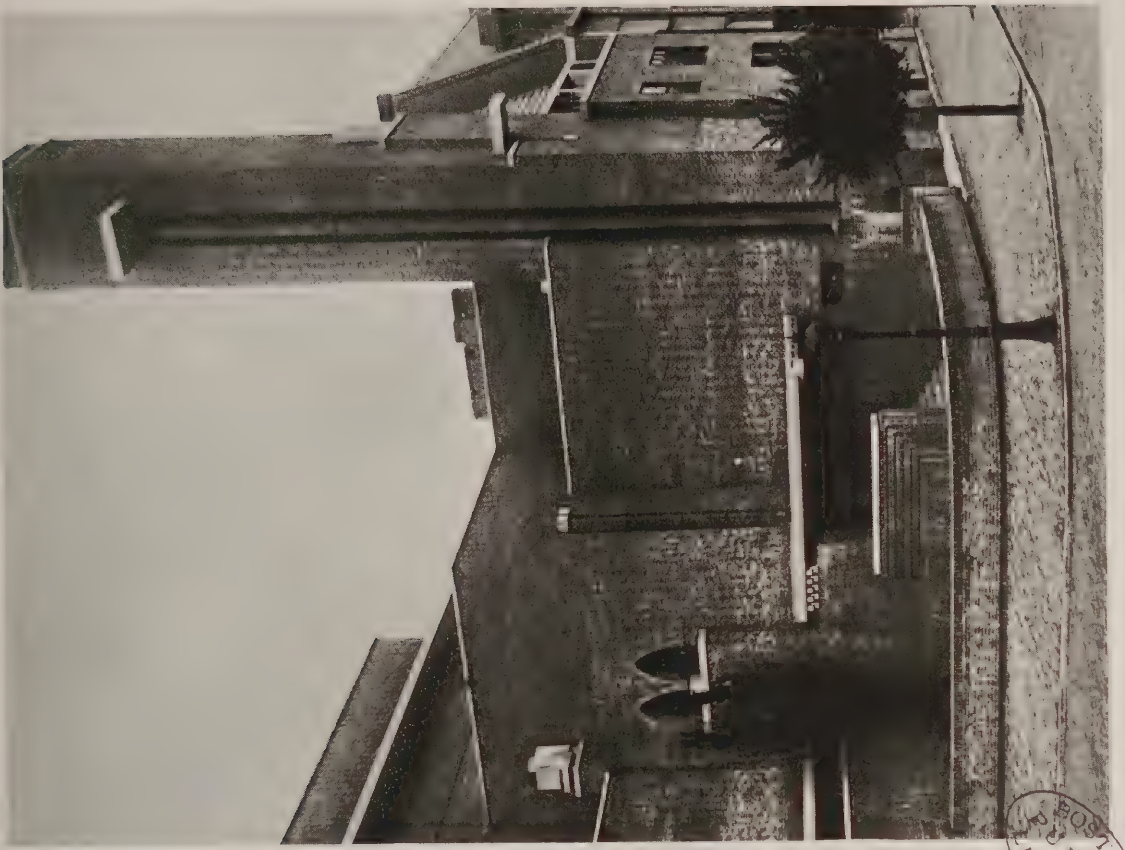
FIGURE IN SIDE CHAPEL



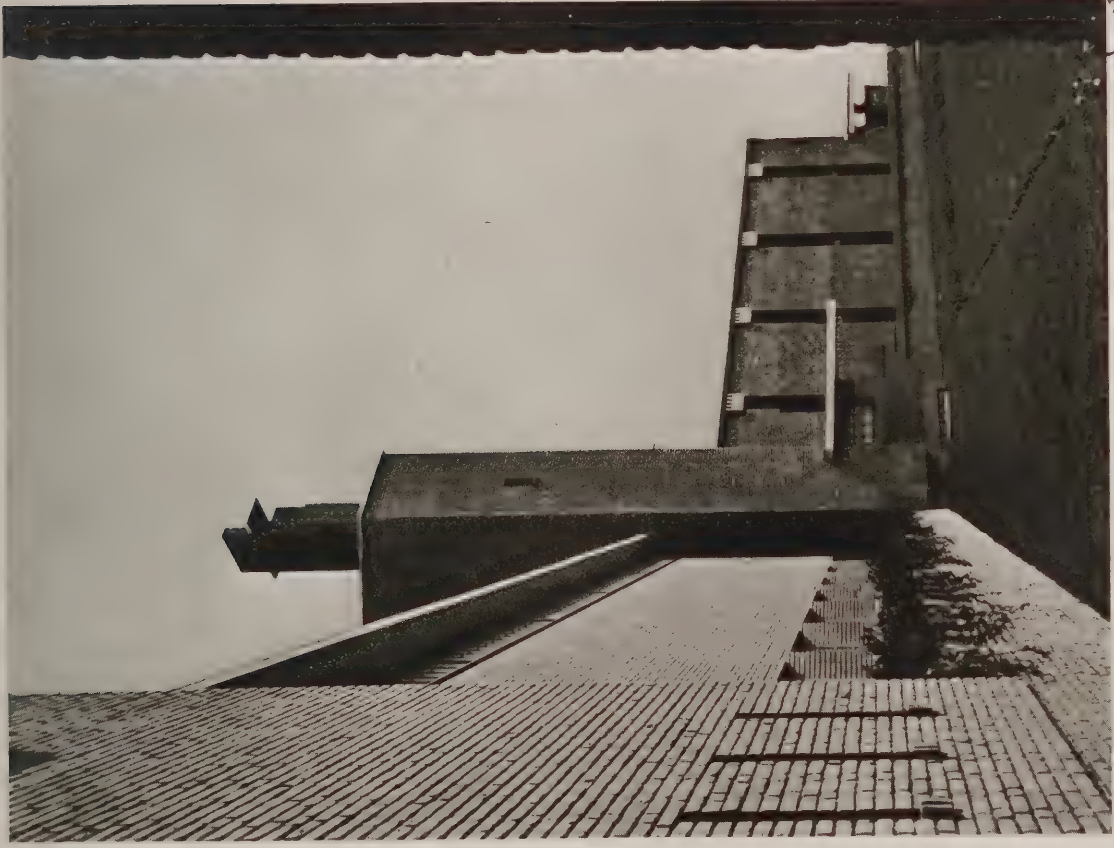
A STATION OF THE CROSS

CHURCH OF ST. THOMAS THE APOSTLE, CHICAGO

BARRY BYRNE, ARCHITECT

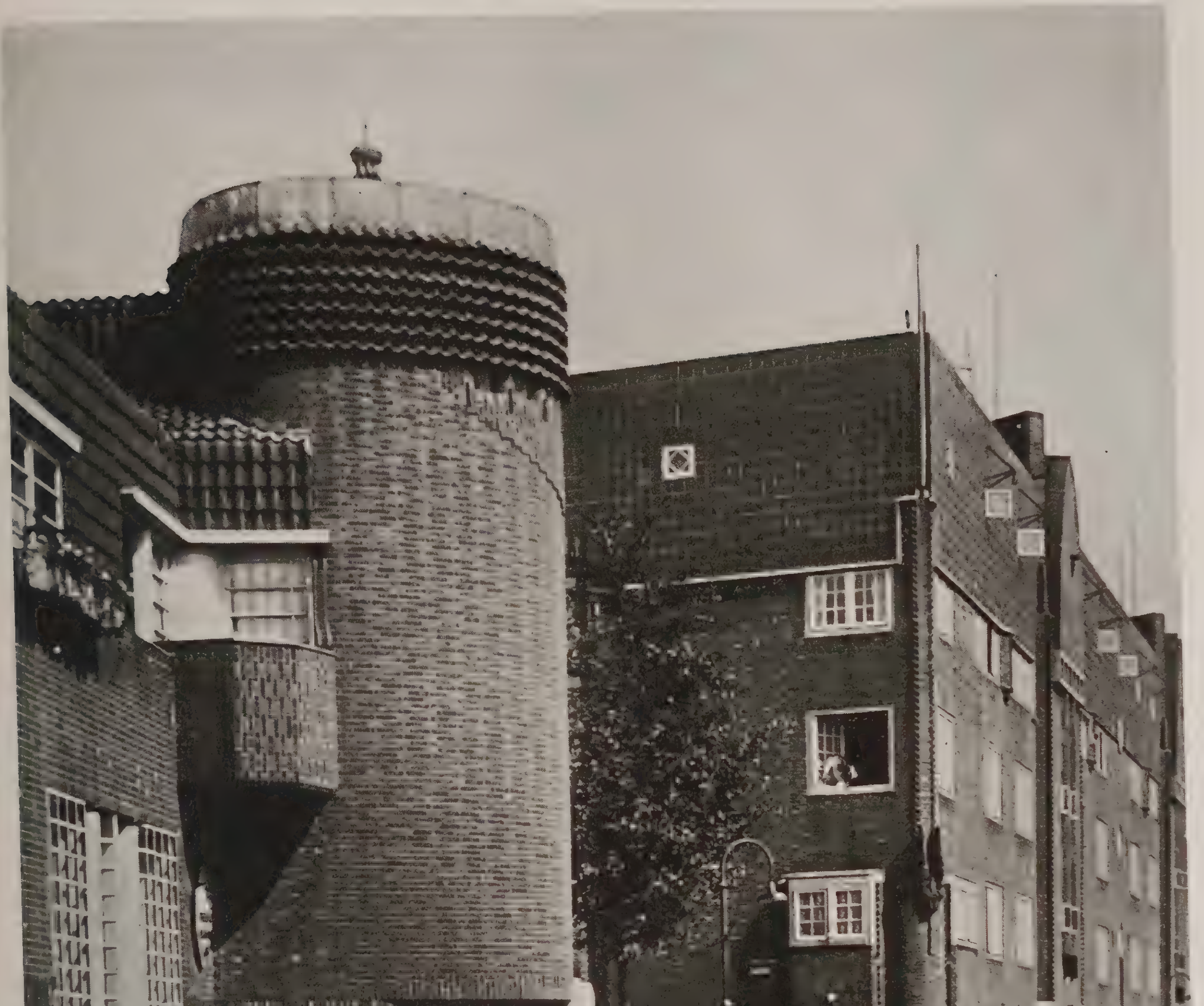


SYNAGOGUE AT AMSTERDAM



SCHOOL AT HILVERSUM, HOLLAND

Photos. Bonney



POST OFFICE AND APARTMENT HOUSE AT AMSTERDAM
DE KLERK, ARCHITECT

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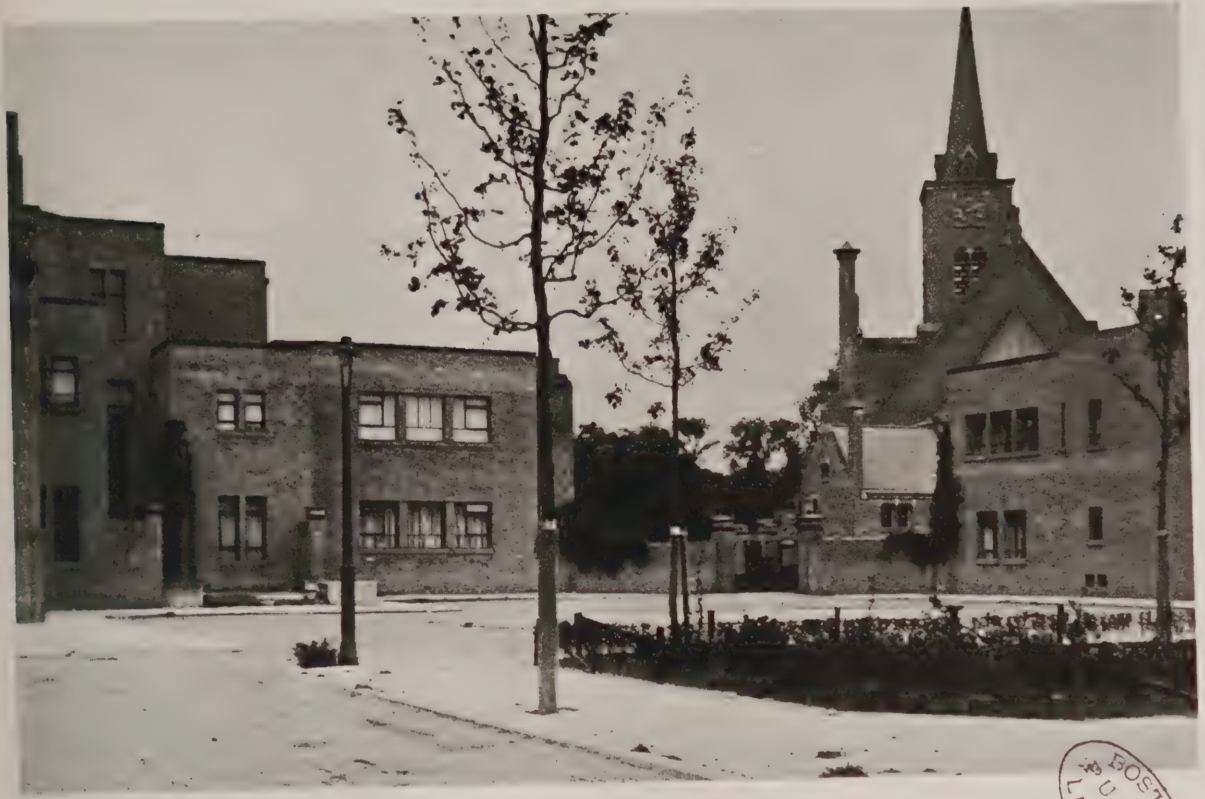

CHURCH AT THE HAGUE
KROPHOLLER, ARCHITECT

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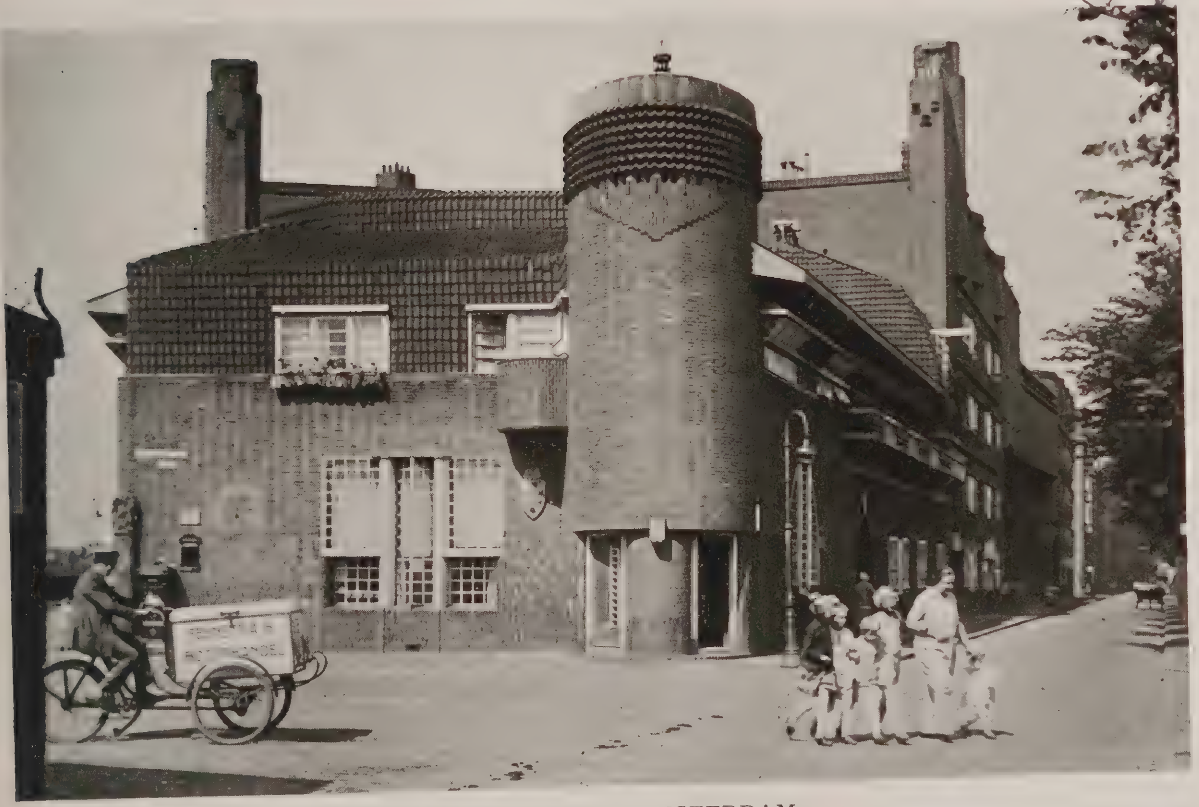
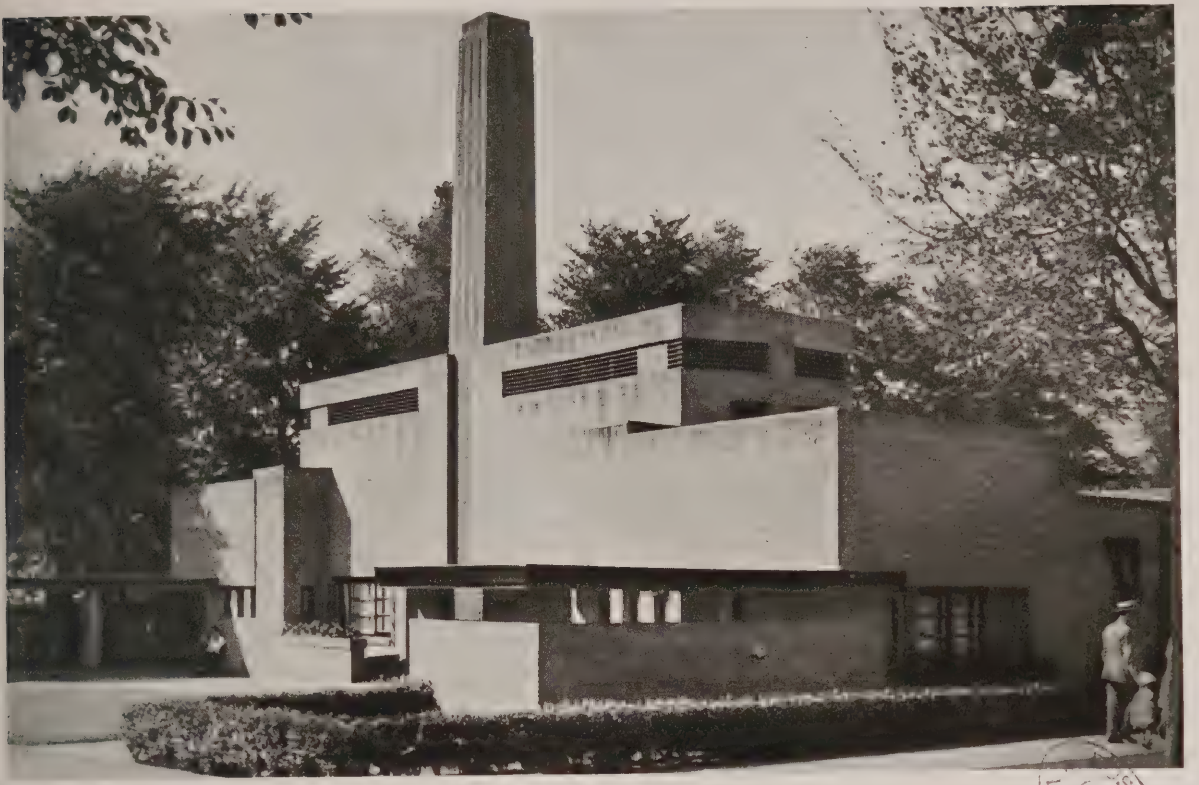


POST OFFICE AT AMSTERDAM
DE KLERK, ARCHITECT



BATH HOUSE AT HILVERSUM, HOLLAND
DUDOK, ARCHITECT

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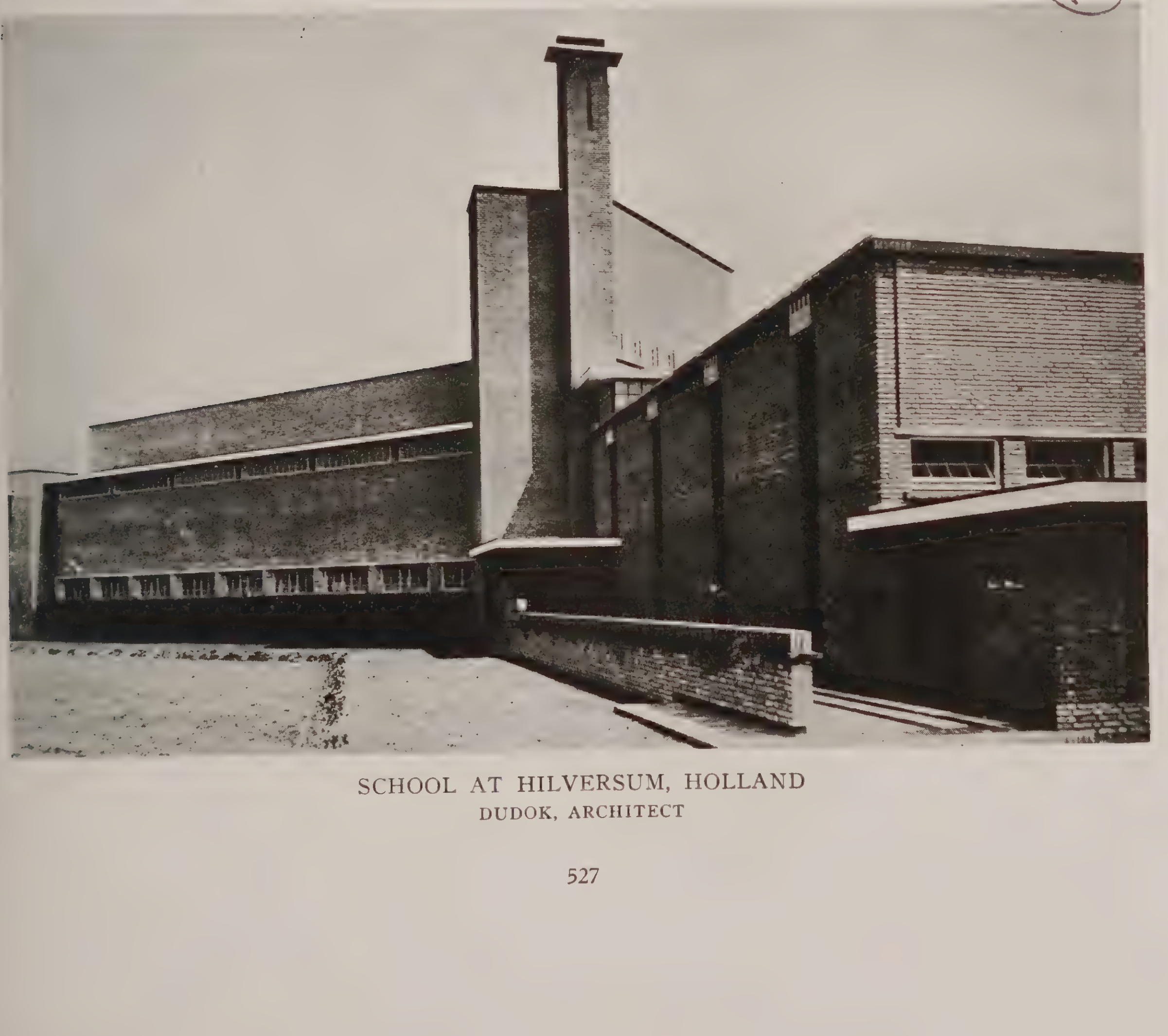


SCHOOL AT HILVERSUM, HOLLAND
DUDOK, ARCHITECT

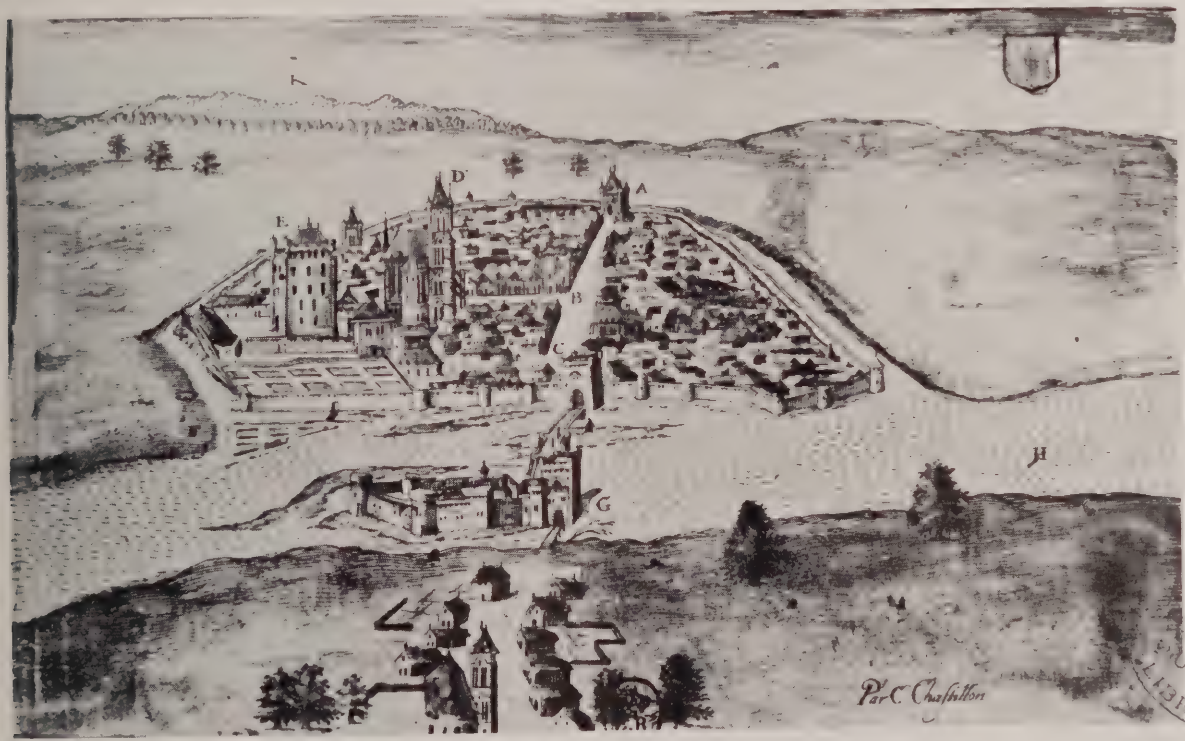
PRIEURE DE PONTLOUP, MORET-SUR-LOING

BY

MILTON D. LOWENSTEIN

THE staunch, mellowed walls of Moret's houses rise above the verdure drooping from crumbling ramparts and trailing incontinently into the waters of the Loing. Where the river rushes from the Forest of Fontainebleau, ivy and willow shoots compete in hiding new romances or suggesting romances which are old! Amiable matrons and giggling girls paddle their laundry on the stone-lined bank while exchanging pleasantries with artists sketching on the opposite shore. Halfway across the stream, partially supported by an old bridge, a deserted mill offers mute encouragement to the whims of fancy and tempts the eye upstream to the *donjon* of Louis VII's old castle peeping over the tops of aging willows. Where the sturdy bridge of Saintloup, or Pontloup as it is called, leaves the shore, a heavy watch tower, the sole remains of the twelfth century defences, performs the duty of town gate and bridgehead. Towering above this scene, the old cathedral occasionally gives out the deep-throated lament of neglected age.

Caesar's commentaries mention a certain Gallic king by the name of Moritus who reigned in a kingdom which later was joined to that of Syagrius. Eight hundred years later the archives tell of an abbot, Loup. He was chosen by Charles-le-Chauve to succeed the treasonable Odon. The first meeting place selected by Loup for the bishops of his neighborhood was Moritus. As the differences between barbarian and Roman became less pronounced, a common language made "Moritus" into "Moret." Until 1081 the town formed the northern limit of the Duchy of Burgundy. Philip I then obtained Moret from Robert the Elder, his uncle, Duke of Burgundy, in exchange for some islands in the Seine. A hundred yards from the eastern end of the old bridge and now jutting into the road leading to Vezelay, are the ruins of a priory built even earlier than the venerable town cathedral. According to a map in the archives at Melun, all the territory that bounded the river outside the town walls once belonged to the monastery of Pontloup. The lands were held in fief to the king, who maintained control through the usual *baillis.* The support which royalty gave brought a prestige that increased the popular demands made upon the monastery. The monks had to add to the offices of the church certain secular duties. Eventually, specialization promoted the rise of orders in which monks were trained for limited activities. The Order of St.



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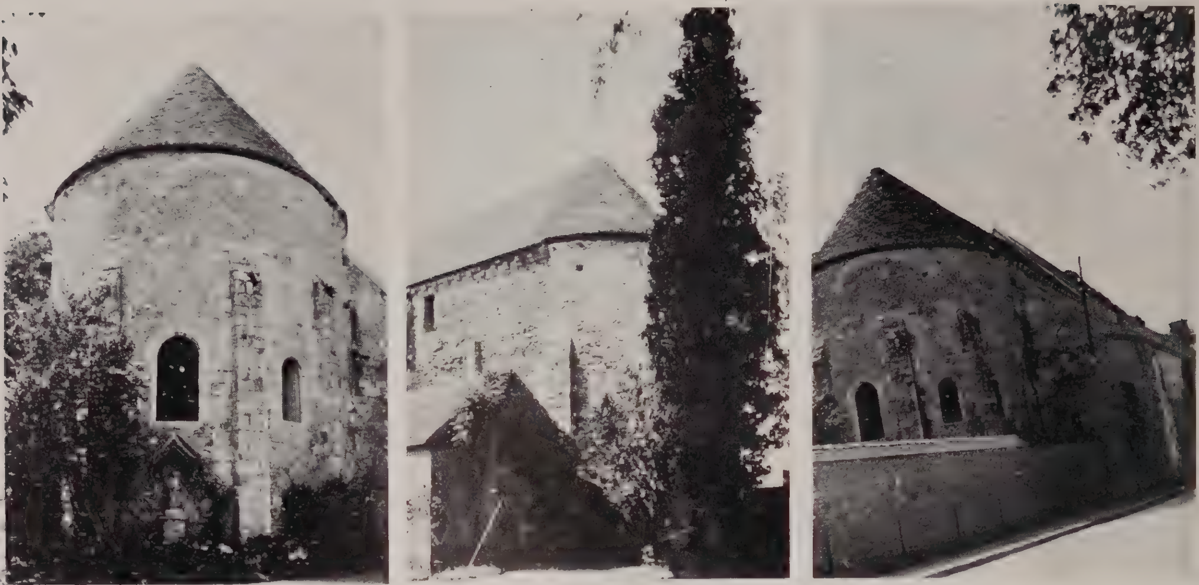
From an Old Print

Prieure De Pontloup in Foreground



Church of the Prieure De Pontloup, Moret-sur-Loing

Lazarus was given the exclusive right to construct a hospital outside the walls of Moret, a hospital in connection with the Prieure de Pontloup.

In the archives of the Benedictine abbey of St. Madeleine at Vezelay, there is a mss. by Hugues of Poitiers entitled *Historia Vizeliacensis Monasterii.* It appears to have been written between 1156 and 1168. The document contains a list of the priors of the dependent Prieure de Pontloup, but with no clue to the date of its actual foundation. The first prior named is Hugues. He is also mentioned in connection with a quarrel which took place during the time of Pope Eugenius III (1145-1153) between the abbot, Pons de Montbloissier, and the Bishop of Autun, Henry of Burgundy. A monk of Vezelay who witnessed the subsequent inquest also writes of Hugues, the Prior of Moret, as having conducted the monk to Auxerre where the Abbot of Ambry (Albericus) was ordained *sous-diacre* by the Abbot of Pontigny. The latter held office from 1113 to 1136. The Prieure de Pontloup must therefore date from before 1136, the date of Louis VII's ascending the throne. Shortly after this event, the Count of Chalons massacred the monks of Cluny, and the Count of Clermont ravaged the church at Clermont. Louis retaliated by confiscating part of their lands and giving them to his friend, the Count of Nevers. The latter, taking advantage of the king's embarrassment over the divorce of Eleanore of Aquitaine, attempted to seize the monastery at Vezelay. Some of the monks fled to Paris to petition the harassed monarch, and a number sought refuge at the Prieure de Pontloup.

The priory was the logical and æsthetic architectural expression of western culture. Without achieving total severance from architectural tradition, the priory's style developed under the influence of indigenous forces. Local prejudices found expression in important features of construction. The redundancy and inadequacy accompanying the use of unfamiliar forms is confined to the details. The plan of the priory church shows three aisles, each terminating in an eastern apse. The bays of the center aisle are oblong, while those of the side aisles are approximately square, as is also the crossing. The steps which extend across the middle of the nave and aisles mark approximately the junction of the original twelfth century construction and what was added later at various times. The nave vaulting is supported on piers, each of which has an engaged column on the nave side and extends to just below the sill of the clerestory windows. The two piers bounding the west side of the crossing have engaged columns on the transept sides as well. Short and stalwart, they bear a better relation to the arches they support than do the more attenuated columns in the western end of the nave.

Except in the south wall, which has been replaced by a modern rubble construction, there remain portions of all the original exterior walls and their buttresses. From the disposition and size of the latter it was possible to make a restoration of the tower and the transepts. The exterior of the apses does not attain to that perfect roundness found in examples more dominated by classical influence. The central apse tends to be a polygon, the angles of which become rounded as the roof is approached. The two small apses are rounded externally a short distance from the ground; above they are corbeled out to a rectangular form in order to receive a lean-to roof. In plan, both small apses turn away from the central

Church of the Prieure De Pontloup, Moret-sur-Loing

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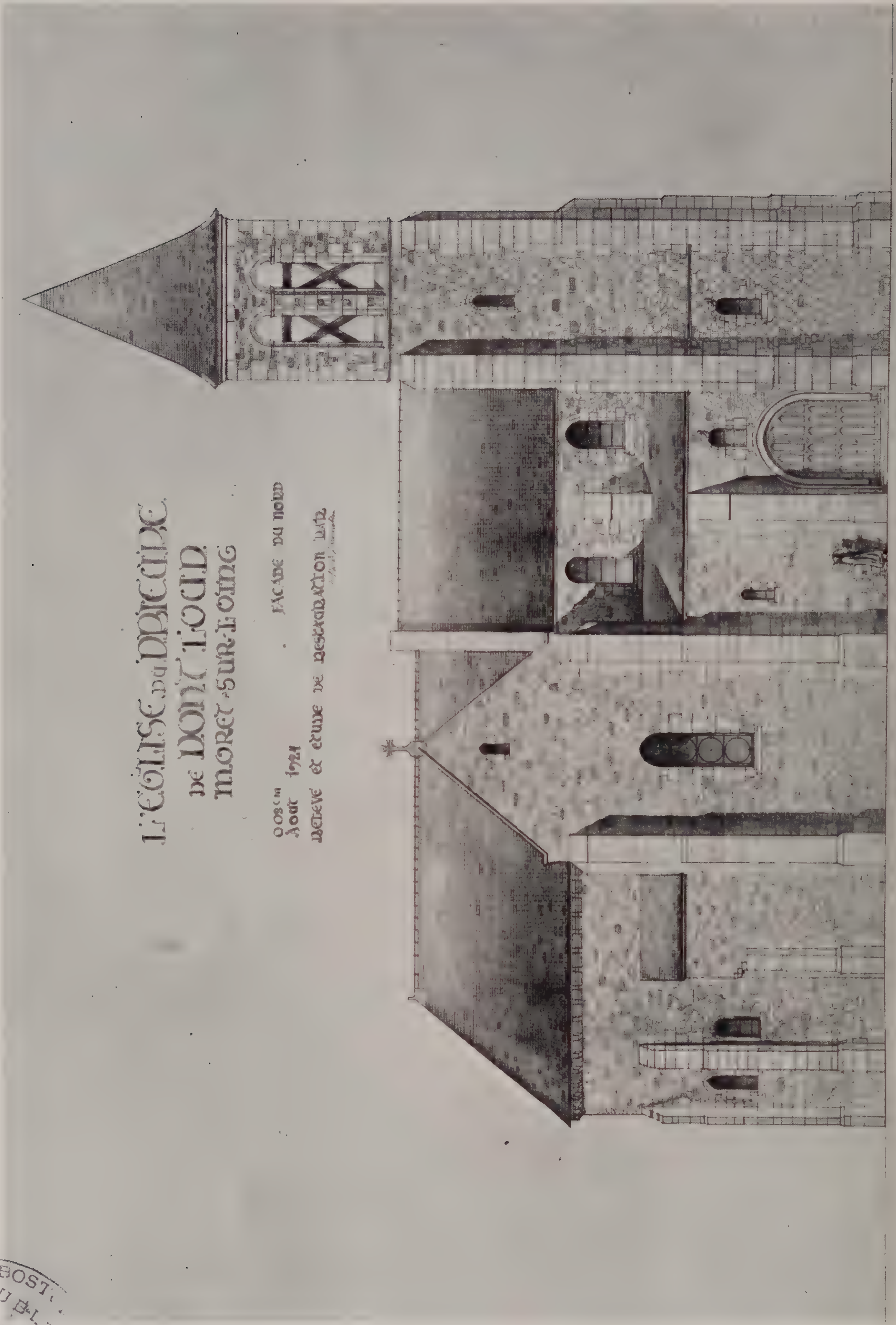
apse, and the thickening of the walls at the junction of the apses allows support for a barrel vault over the choir.

Most of the groined vaulting of the north aisle is still in place. It is supported on pilasters of the north wall and on the nave piers. No transverse ribs connect the pilasters or the piers. They are used only from pier to pilaster. All the groins have semi-circular profiles. This brought the key of the vault higher than the keys of the transverse arches. The latter, therefore, had to sustain the thrust of the sloping vault sections. In the center aisle where the oblong bays would have made the difference in elevation excessive, the wall arches were pointed over the clerestory windows, though only traces in the clerestory wall remain to indicate this fact. These vault intersections are evidence of there having been groined vaulting over the center aisle. This was seldom attempted in any but the smaller churches,—Issy-l'Eveque (Saone-et-Loire), Pontaubert-et-Sacy (Yonne), etc. More examples are found in the south,—Chambon (Creuse), where no transverse ribs are employed. The influence of Cluny and Citeaux brought the groined vaulting of the nave to Laach in 1156, and later to Eberbach and the cathedral of Speyer and Mainz. But its unwieldiness and the lack of any great need for light precluded its adoption in Burgundy and Auvergne, where its use was reserved for the side aisles.

As seen on the north elevation, buttressing was used to strengthen the clerestory wall. There are no examples in this neighborhood of the transverse barrel vaults over the nave such as were used at this time in Tournus and which obviated the necessity of having buttresses and at the same time allowed ample room for clerestory windows. The system of using the transverse vaults of the side aisles to buttress the nave vault, employed extensively in Perigord and Anjou, is not found farther north than St. Pathus. The ribbed vaulting over the transept crossing has ogival transverse ribs. By eliminating most of the slope from the vault sections, they are able to transfer all the thrust to the piers. The ribs are rectangular in section and stepped out to receive the vaulting material. The diagonal ribs spring from corbels. These span the reëntrant angles of the abacus which is continued between the capitals as a string course. Their section consists of two three-quarter rounds separated by a wide arris.

Simplicity rather than severity characterizes the capital and base design. The leaves forming capitals are reminiscent of Egyptian palmettes and are not mere scratches but mould the surface of the block. They have a suggestion of veining and texture, and as they sweep gracefully out from the capital-torus, they seem as far away from the superficial Merovingian ornament as from the obdurately conventional classic. Though the bases are heavy, the proportioning of the elements is such that the column is given a feeling of elegant solidity. There are uncarved knobs between the torus and the plinth. All the capitals and bases, as well as the alternate courses of the columns, have tenons built into the wall. The window jambs and sills are splayed in order to shed water and to facilitate lighting. There are examples in the neighborhood where, to prevent the water from running over the inside walls (or, as a French archæologist suggests, to prevent the dust showing), the inside sill is cut into steps. The voussoirs of the priory windows follow the plan of the sill and contain no carved ornament inside,



RESTORED NORTH ELEVATION
CHURCH OF THE PRIEURE DE PONTLOUP, MORET-SUR-LOING
FROM A MEASURED RENDERING BY MILTON D. LOWENSTEIN

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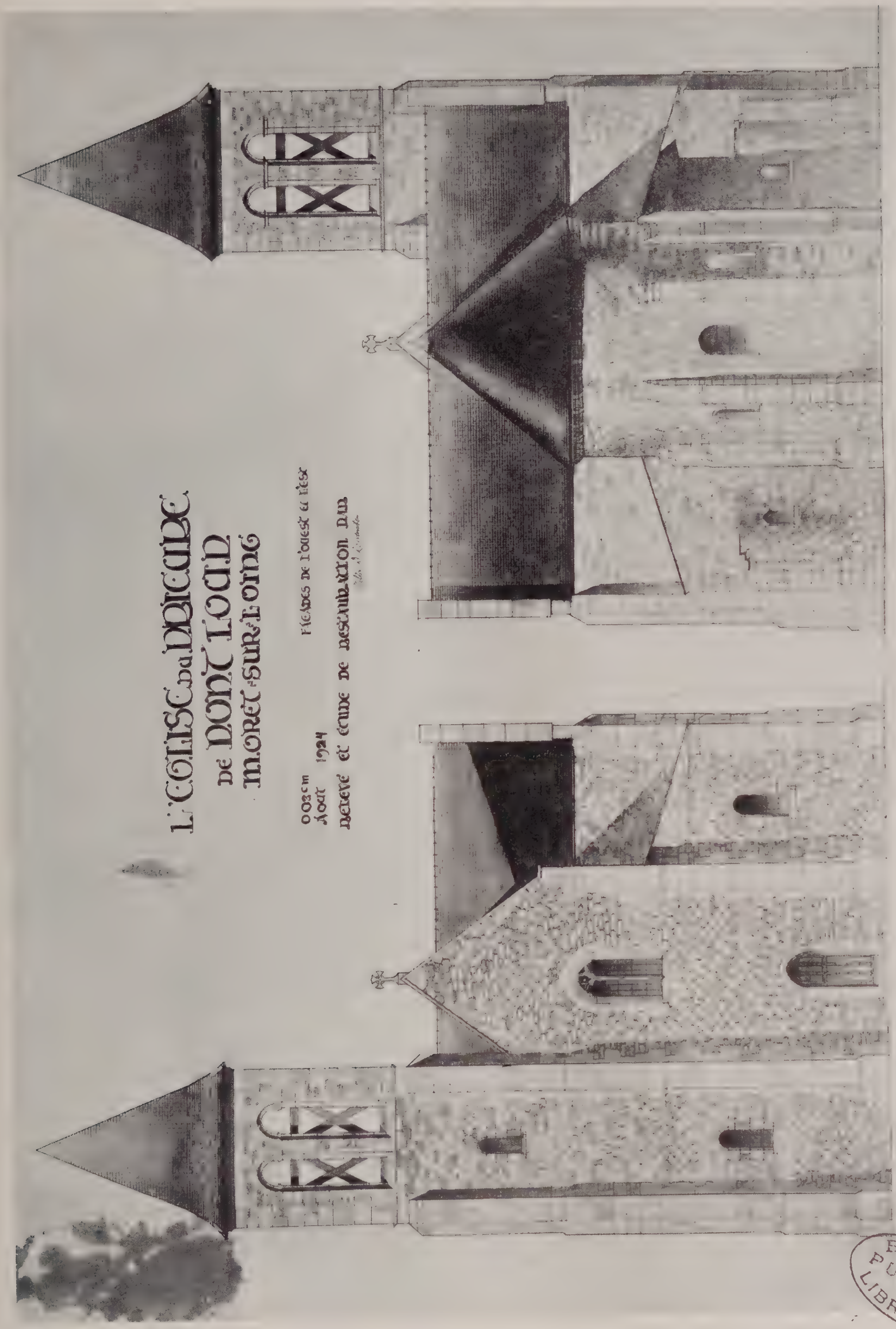

RESTORED WEST AND EAST ELEVATIONS

CHURCH OF THE PRIEURE DE PONTLOUP, MORET-SUR-LOING

FROM A MEASURED RENDERING BY MILTON D. LOWENSTEIN

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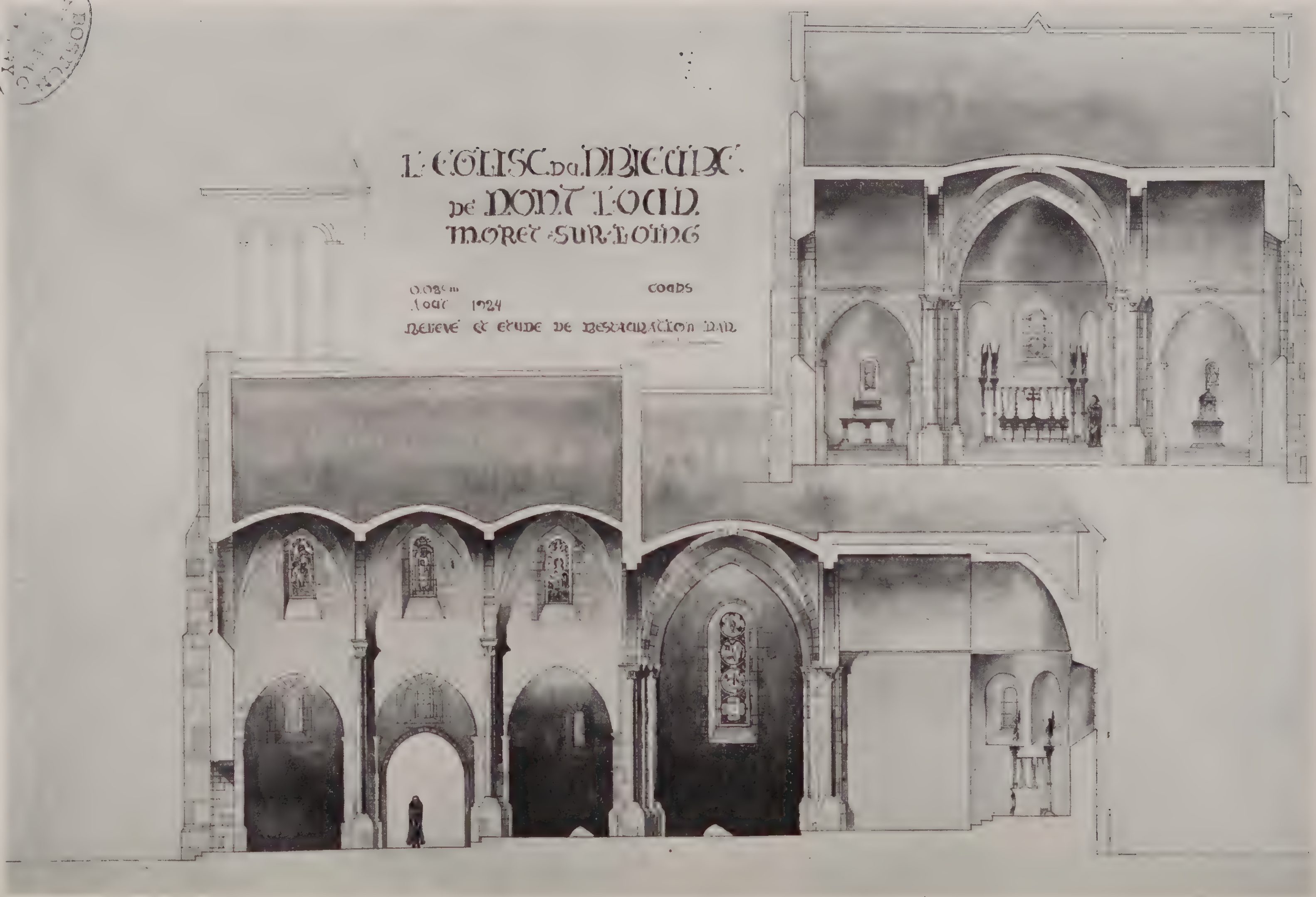
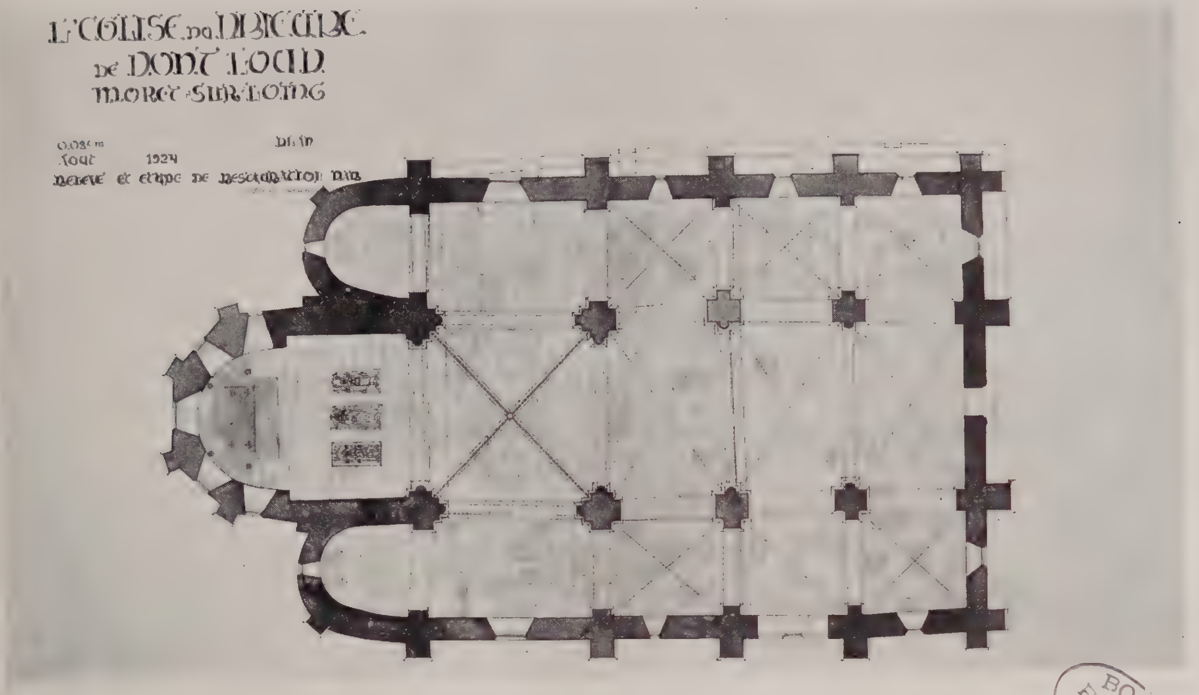


RESTORED CROSS AND LONGITUDINAL SECTIONS
CHURCH OF THE PRIEURE DE PONTLOUP, MORET-SUR-LOING
FROM A MEASURED RENDERING BY MILTON D. LOWENSTEIN



PLAN. PRIEURE DE PONTLOUP, MORET-SUR-LOING
FROM A MEASURED RENDERING BY MILTON D. LOWENSTEIN

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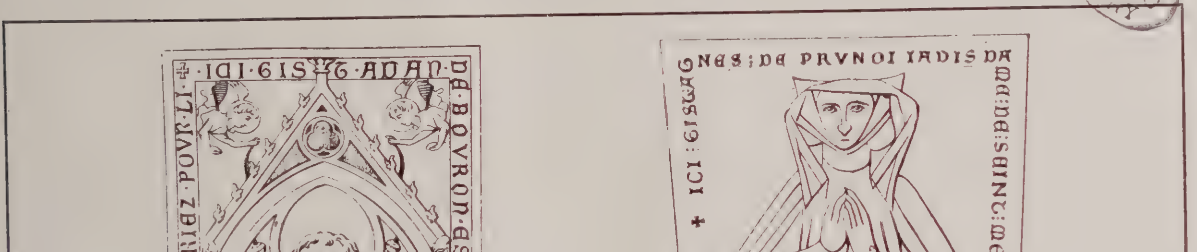
ICI·GIST·ADAN·DA·BOVRON·ESCUIER·QUI·TRASPASSA·AN·LAN·DA GRACA·M·CC·XX·IX·LA·GAVDI·DAVANT·LASANCION·PRIAZ·POVR·LI
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MARKINGS ON TOMBS AT ST. MAMMES
FROM MEASURED DRAWINGS BY MILTON D. LOWENSTEIN

and (except in the western part of the north wall, which has the king's coat of arms) none outside.

The windows in the eastern or older part, are small and round headed, as well as is the window in the north wall of the first bay after the transept. The clerestory windows are slightly ogival and belong to a construction period later than does the apse. A study of the mouldings on the north door indicate that it was built in the latter part of the fifteenth century. Fenestration at the west end of the nave and at the ends of the transepts was usually treated by grouping two or three windows together. But in small churches the better practice was to keep a single window and to harmonize the composition with the clerestory. The restoration shows this treatment.

The tower is indicated as being square, following the design as seen in a seventeenth century wood cut. The style is that of the earlier part of the priory. It was probably vaulted at each of the floor levels. The use of glass was confined to the lower floors, and the openings in the belfry were made as large as possible. Here were hung the chimes which were removed in 1791 and sent to the mint in Paris. The tower roof was supported on wooden trusses and covered with slate. A metal ball usually surmounted the peak and contained relics to give protection against lightning. A wooden beamed ceiling might at first have covered the entire nave of the priory. When it was replaced by the groined vault, the wood-framed roof was retained. Instead of using the kingpost construction of antiquity, the roof trusses were formed into a letter "A" into which were let the longitudinal beams. The rafters were extended to the outside edges of the walls. That part of the roof which projected was carried by plain, heavy corbels on the eastern part of the priory, and upon a continuous string course on the newer western part. This entire superstructure of wood served as an "architectural umbrella" for the vaulting underneath.

Though no trace of it can now be found, painted decoration was added from time to time on the interior walls. Its style in the twelfth century must have possessed that piquant virility typical of Burgundian work, tempered by the modest humanism that was permeating the Ile de France. The paintings had neither the ornateness of southern decoration nor the severity of northern forms. Oriental fabrics, chests, ivories, pottery and glass suggested the technique and influenced the style. The subjects were remnants taken from a subtle classic philosophy and broadly interpreted by Christianity into the popular language. Nurtured in the restricted area of a town, these ideas must have developed a distinct local flavor but without sacrificing their folk-art quality with its humanistic common denominator. The so-called barbaric work on painted vases made in Greece in the century VIII B.C. would make an interesting comparison with objects in this "Romanesque" style.

By the end of the thirteenth century monasticism had lost its force as an instrument of the king. By a gradual introduction of Roman civil law, Philip IV abrogated all local authority. He excluded ecclesiastics from office in the parliament formed in 1287, and in 1307 the Knights of the Order of Templars were arrested on various charges of heresy, and their property was forfeited. Guillaume de Noyers, the third prior of the Prieure de Pontloup, who entered office in 1383, cites an indication of monastic decadence in his account of the war between John the Good and Charles, King of Navarre. "Owing to the fortunes of war," he writes, "the buildings and other resources of the priory were considerably reduced." One can understand the confusion of the time when destruction wrought in 1359 was not yet repaired in 1383.

It was not until the end of the fourteenth century that the western part of the priory was rebuilt. The stereotomy of the base and lower courses corresponds with that of the eastern part and indicates that the original priory church occupied the entire site of the present building. The reconstruction included everything west of the transept. It is difficult to explain the portion of a partition which extends across the junction.

The prior lived at Vezelay and rented *"la recette generale du revenu temporal"* to agents who received a part of the tithes collected from the old mill and what little remained of the other feudal holdings. The religious fanaticism of a passing dynasty interrupted the process of deterioration to effect a further restoration. Among Henry II's chivalric gestures are the heraldic emblems carved on the window lintels of the north wall. In 1747 the seminary of Sens, which had annexed the priory, proposed to demolish it. But two old monks who were acting as caretakers succeeded in moving the town authorities to oppose the project on the grounds of sacrilege. Even after the revolution the crumbling walls still guarded some of the original relics,—a fragment of the altar and the chimes. Neighboring towns bid for the spoils. One of them, with a church of approximately the same period, secured the altar. The national government intervened when it came to the question of the chimes, and they were claimed for the mint in Paris. The reliquary, the design of which is suggested in the section, went to the town cathedral. This legitimate destiny, however, did not save the relics themselves from the scruples of enlightenment. In 1858 the bishop ordered the cure of Moret to bury the relics in the cemetery, since no certificates of authenticity could be produced!

AND NOW—A "MODERN" HOUSE

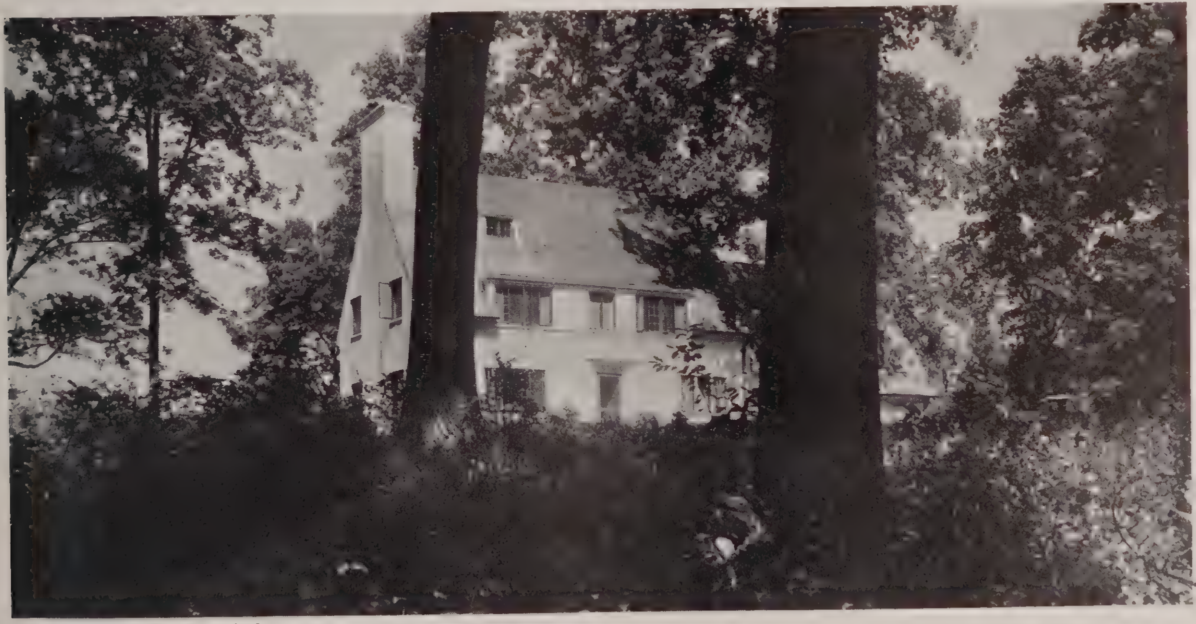
BY

R. W. SEXTON

WE are gradually becoming accustomed to "modern" architecture. We find the sharp angles that once disturbed us not at all illogical; strange forms do not seem as eccentric as they once did, and even purely geometrical motifs seem to have an ornamental value that only a few months ago we would never have thought possible. A change from sixteenth century ideas to twentieth century ideas at one sweep is bound to jar us by its very suddenness. But already we admit, to ourselves at least, that we do more work, and get more pleasure out of it, in a modern office building; that we really enjoy a play more in a modern theater, and that we find a meal tastes better in a restaurant designed in the modern manner. But a modern house! Why?

A "modern" house is not a "freak" house (although that is what most people think it must be) any more than a modern office building is a "freak." A "modern" house, after all, is one in the design of which the architect has given expression to his creative ability. Although a house in the modern style naturally suggests that the designer does not follow too closely any one style or period of architecture, it must not be understood that the design of such a house cannot bear certain evidence of the influence of some historic style or period. A house is modern because its plan is developed to conform to the needs and requirements of those who are to live therein; because its design reflects the character and personality of the owner; and because it is constructed of materials which are peculiar to the times and to its locality.

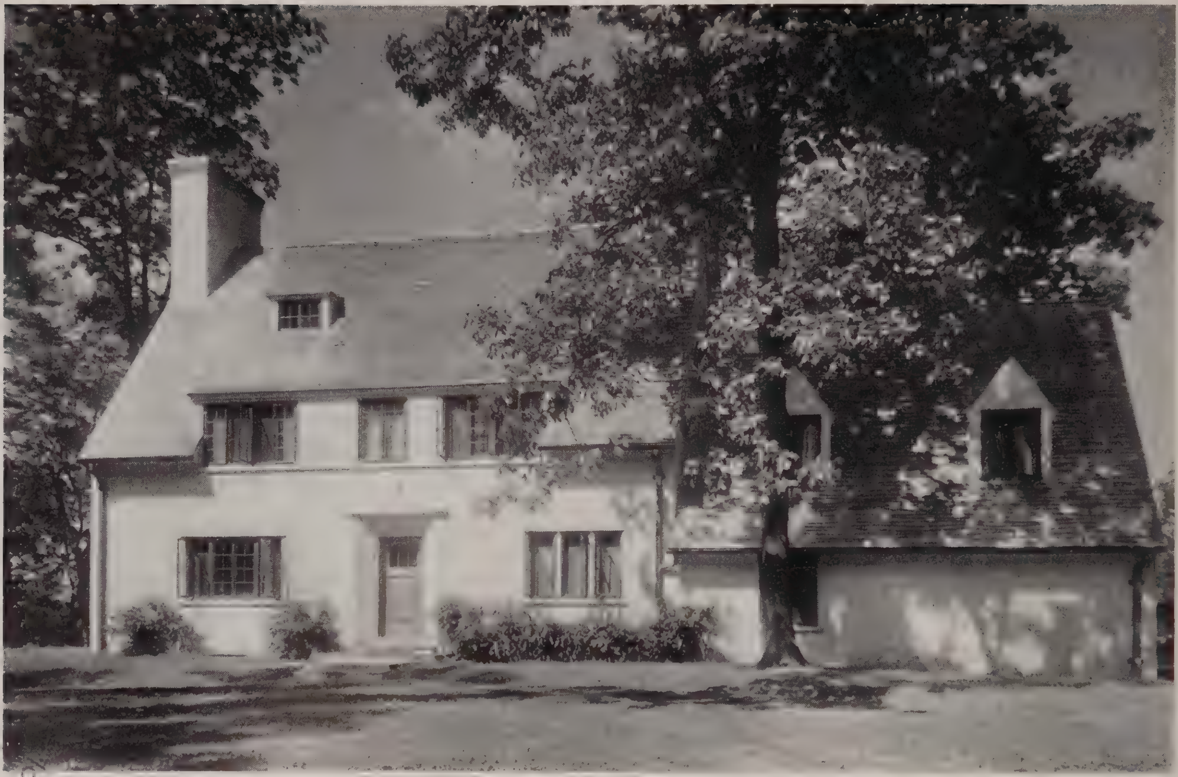
According to this formula, the house of H. L. Hoyt at Great Neck, N. Y., is a modern house. There is nothing radical about the design, and yet it cannot be said of it that it is designed in the style of some historic period. The architect, Julius Gregory, was presented with a modern problem, and a logical solution has naturally resulted in a house that is modern. It is particularly interesting to note that those details of the design which are peculiarly modern in character have been attained by the use of stucco. We so often think that a modern house must be a house constructed of unusual materials. Here is a house of frame construction, with exterior walls of stucco, and yet in many details the design does not follow lines which we have by custom come to associate with stucco. An original design, naturally, to be a good design, must conform at the same time to certain established principles of architecture. One of the most vital of these principles is to retain in the design a character that is in keeping with the material in which the design takes form. It is because Mr. Gregory has applied this principle, while giving expression to his creative ability, that this house at Great Neck is so interesting.



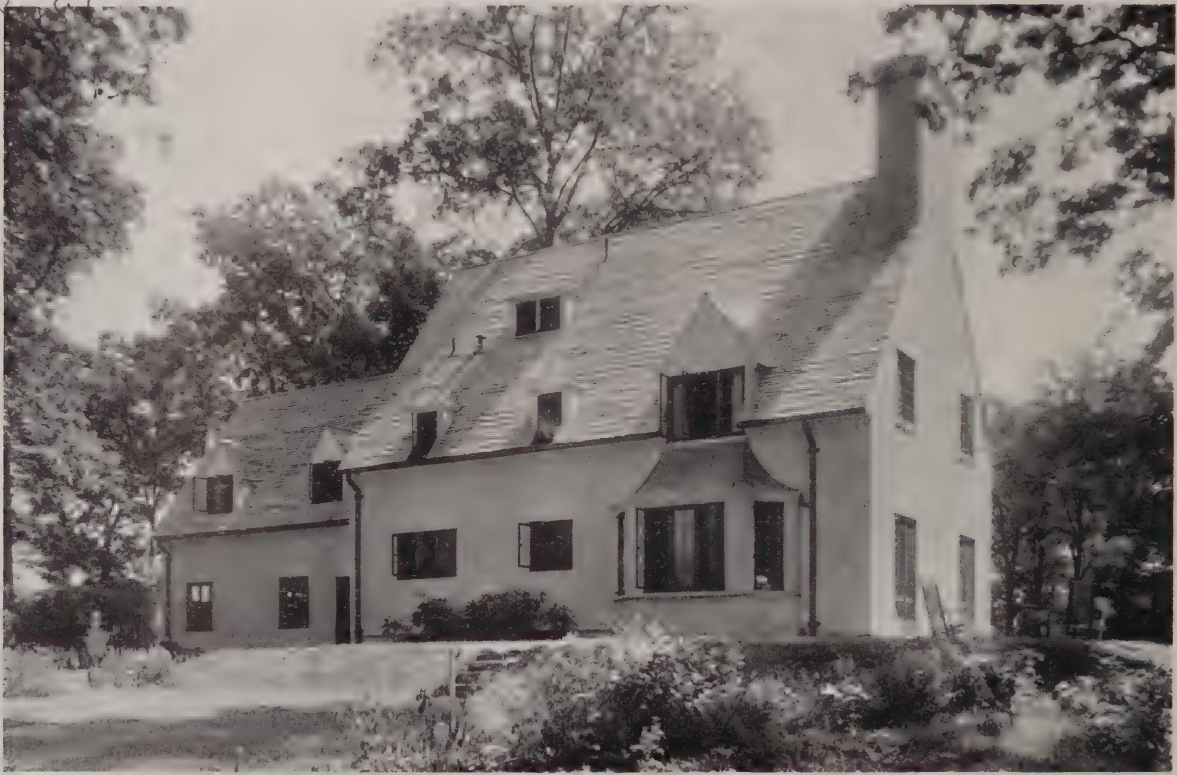
Photos. George H. Van Anda

House of H. L. Hoyt, Esq., Great Neck, N. Y.

Julius Gregory, Architect



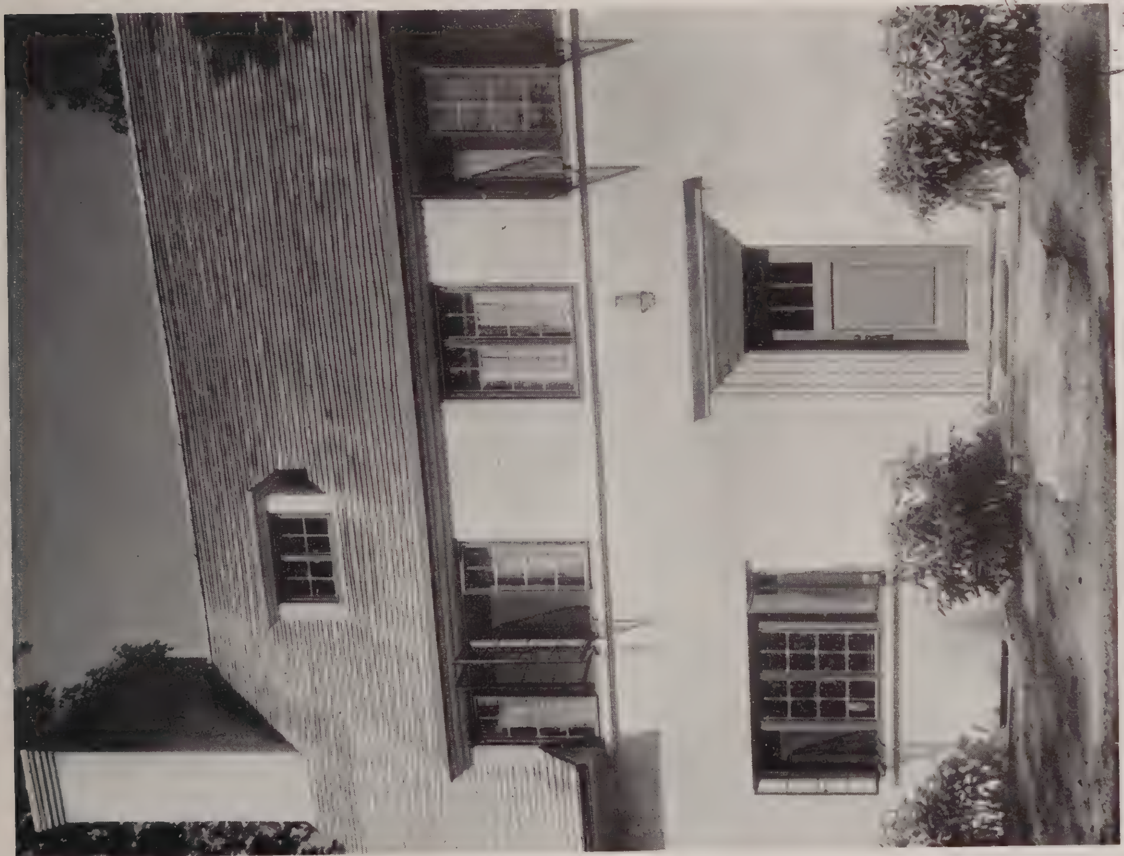
ENTRANCE FRONT



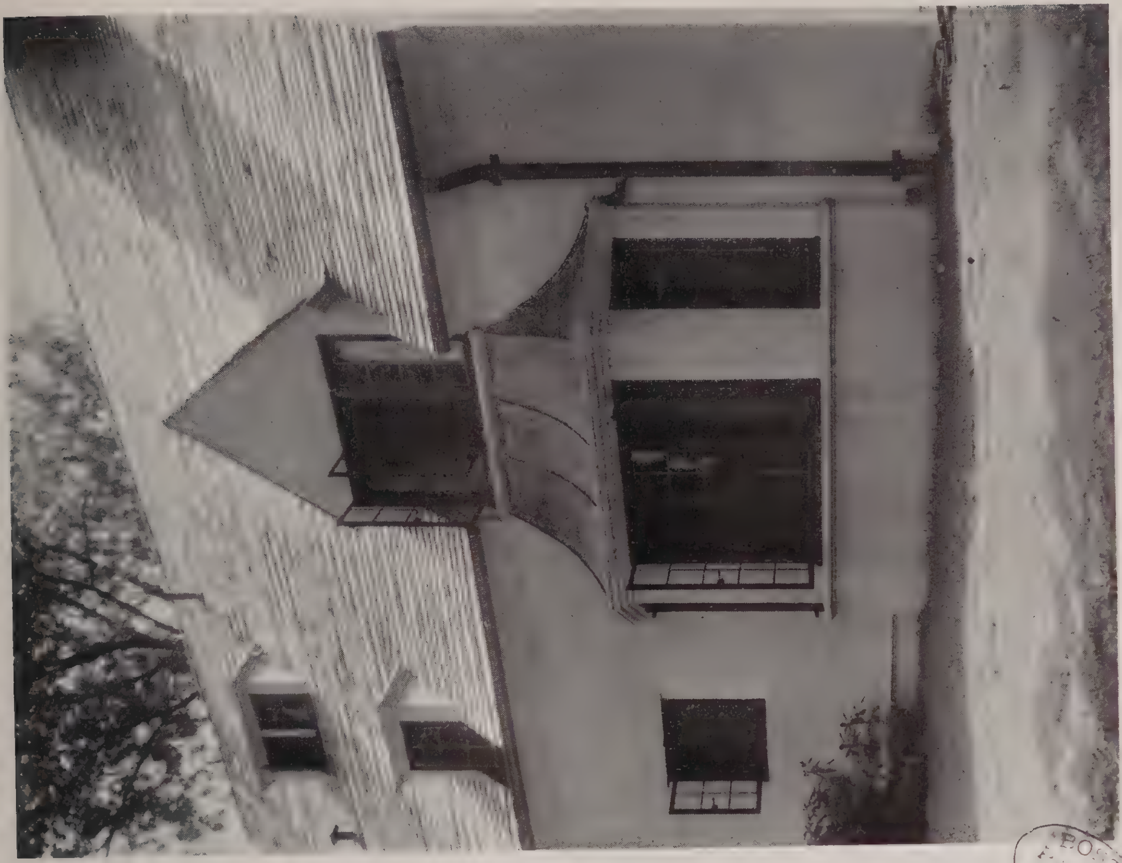
GARDEN FRONT

HOUSE OF H. L. HOYT, ESQ., GREAT NECK, N. Y.

JULIUS GREGORY, ARCHITECT

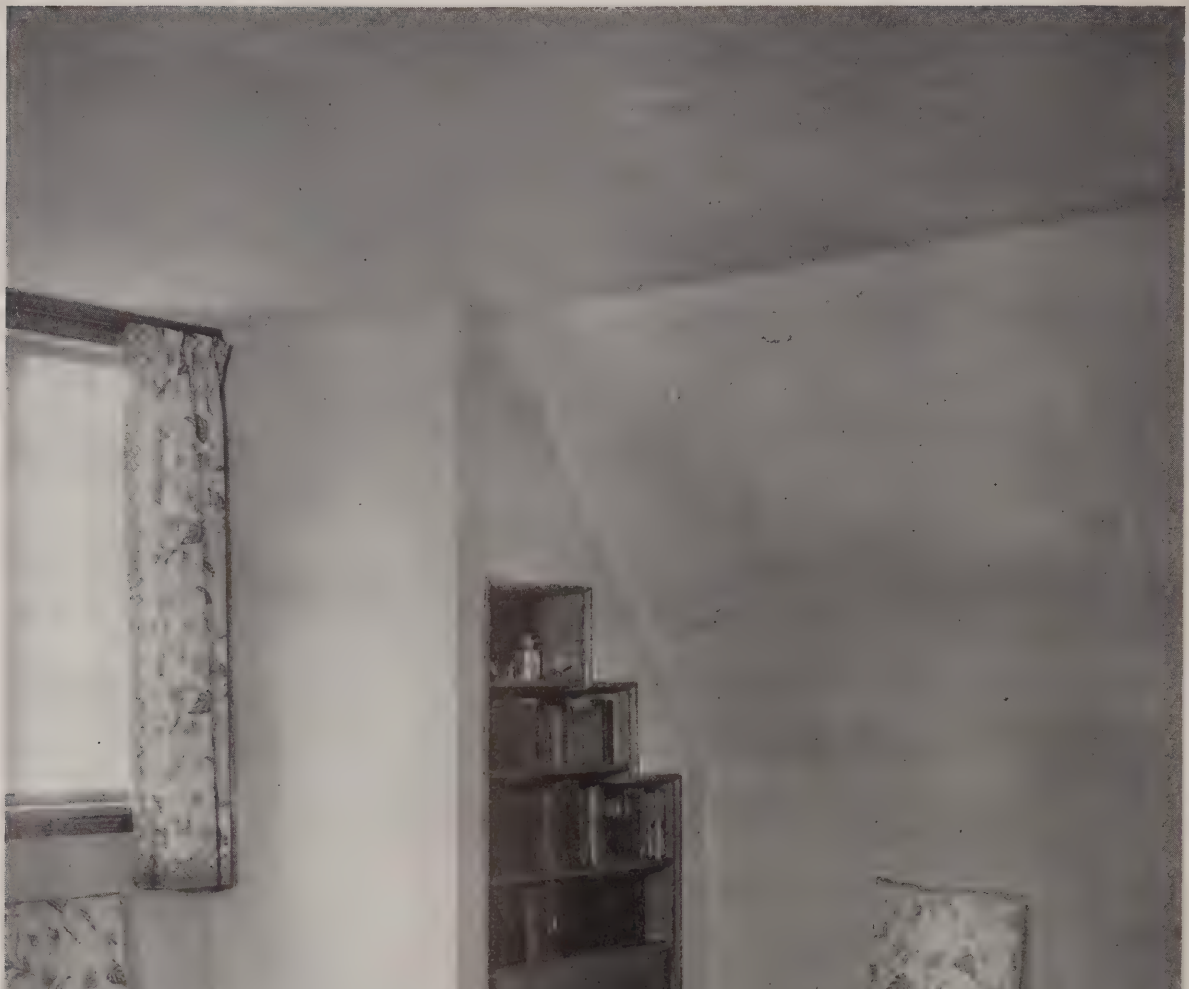


ENTRANCE DOOR



DINING ROOM BAY

HOUSE OF H. L. HOYT, ESQ., GREAT NECK, N. Y.
JULIUS GREGORY, ARCHITECT



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DETAIL IN BEDROOM
HOUSE OF H. L. HOYT, ESQ., GREAT NECK, N. Y.
JULIUS GREGORY, ARCHITECT

THE WYE HOUSE ORANGERIE

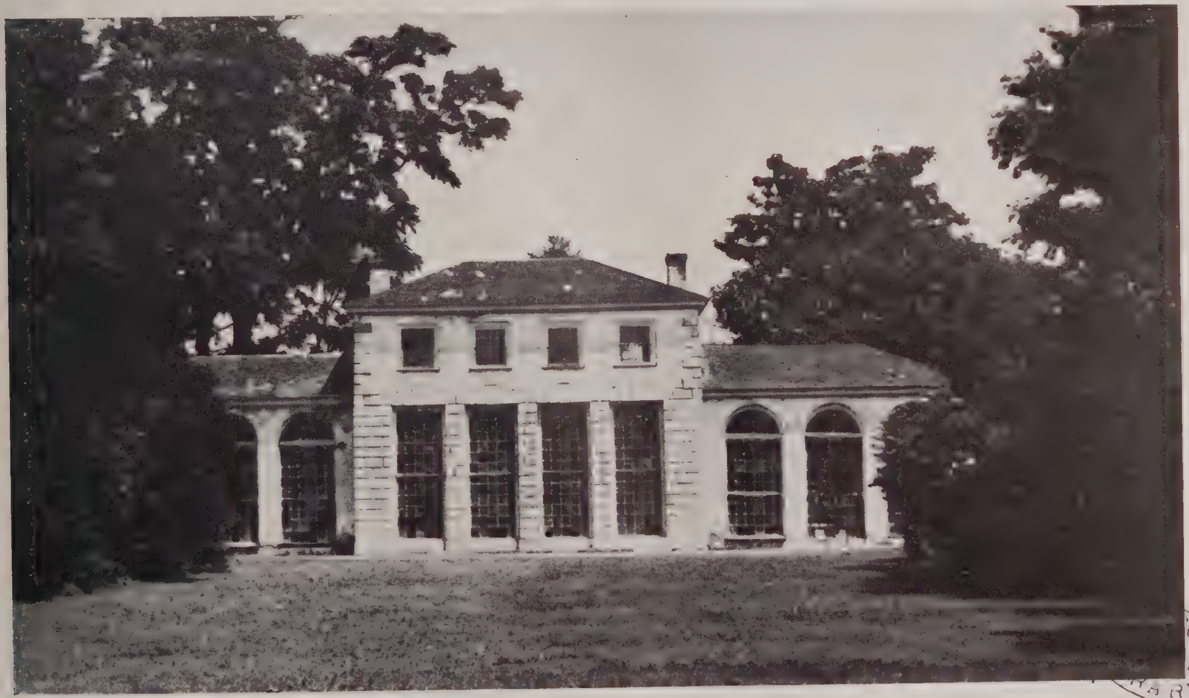
BY

J. DONNELL TILGHMAN

THE orangerie at Wye House, in Maryland, is in all probability the only old example of this type of building in this country. There is no record of the date of its erection, nor is it possible to guess at this with any degree of accuracy, since it is totally different in style from anything else in early American architecture. Wye House itself, of which there is also no definite building date, was constructed some time during the last quarter of the eighteenth century. Traditionally, the orangerie is older, a supposition well borne out by the fact that it is considerably off axis with the house, which it faces across a long bowling green. There is additional evidence that it was part of an earlier garden scheme surrounding the old house, which was partly destroyed by fire.

The orangerie is constructed of brick covered with stucco. The quoins are of stone, although the lintels over the windows are of wood carved to represent stone. The roofs are of shingles. In the second story there is a billiard room which still contains the old table, this room being reached by an outside stairway. The low shed at the back contained a furnace that was fired with large sticks of wood. The smoke from this furnace passed under the floor before finding its way out one of the chimneys. Combined with the sunlight, this produced sufficient heat for the raising of citrous fruits. The building, in the memory of people still living, was used as an orangerie. Both orange and lemon trees, planted in tubs of almost exactly the same design as those still used at Versailles, were kept in the orangerie in cold weather, and were set about the garden during the summer months. Enough fruit was raised to supply the household.

The Wye orangerie, which is as beautiful as it is unusual, is the focal point of one of the most extensive and beautiful American gardens that date from the eighteenth century. Unfortunately, the accompanying illustration shows no part of the gardens. A broad lawn flanked by tall shrubbery and trees forms the simple setting of this interesting and unusual bit of architecture. It is interesting to realize that even in this country prior to 1800 great mansions and estates were built by the rich and distinguished Cavalier families of the south, homes rivaling in beauty and importance the work being done in Georgian England at that time. The care shown in the study of this design is characteristic of the architectural work of this period. The windows are well proportioned and in splendid scale. Not only the small, square windows of the billiard room on the second floor, but also the many small panes emphasize and indicate the unusual size of the great windows of the first story.



The Orangerie, Wye House, Talbot County, Md.

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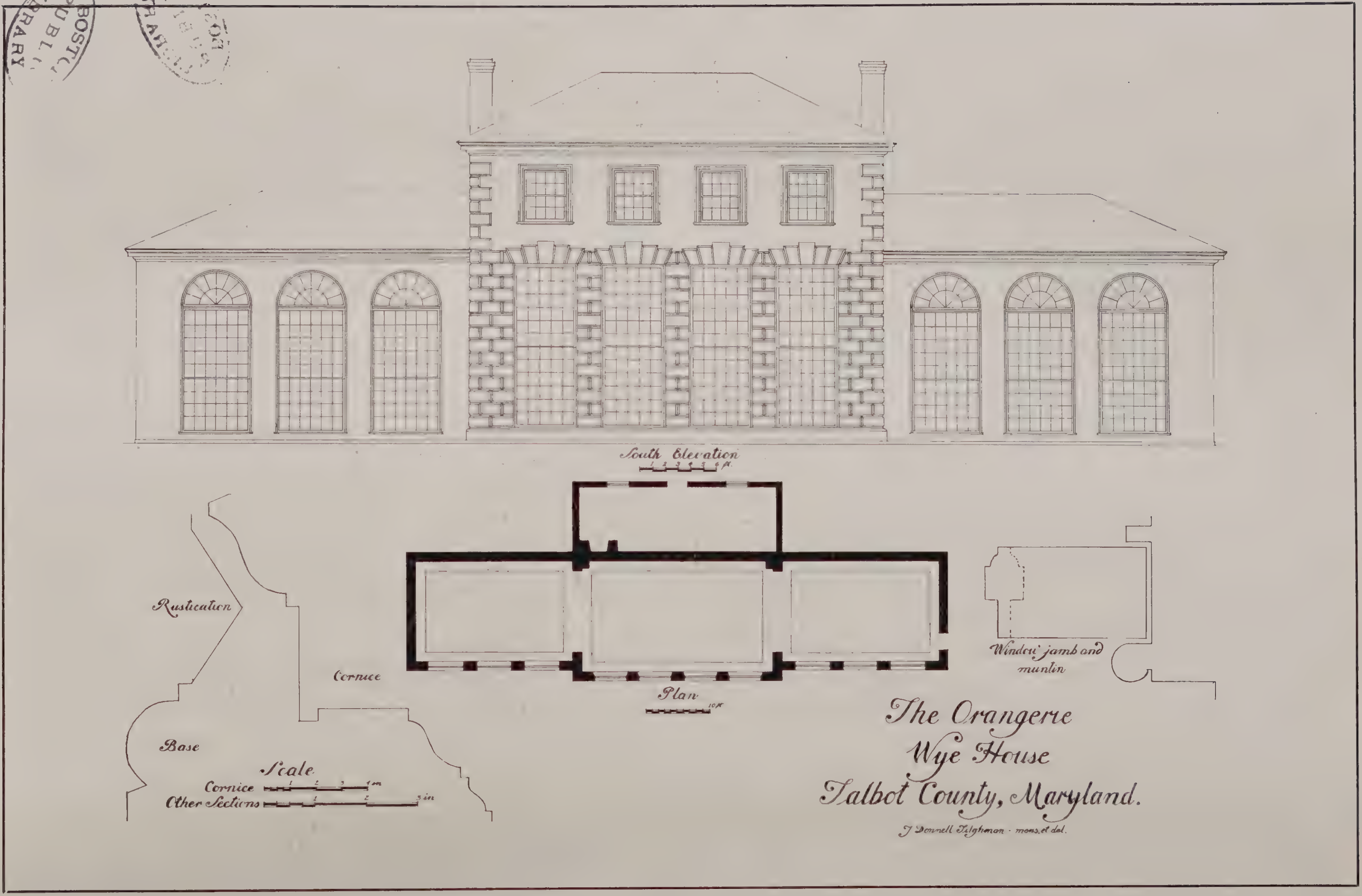
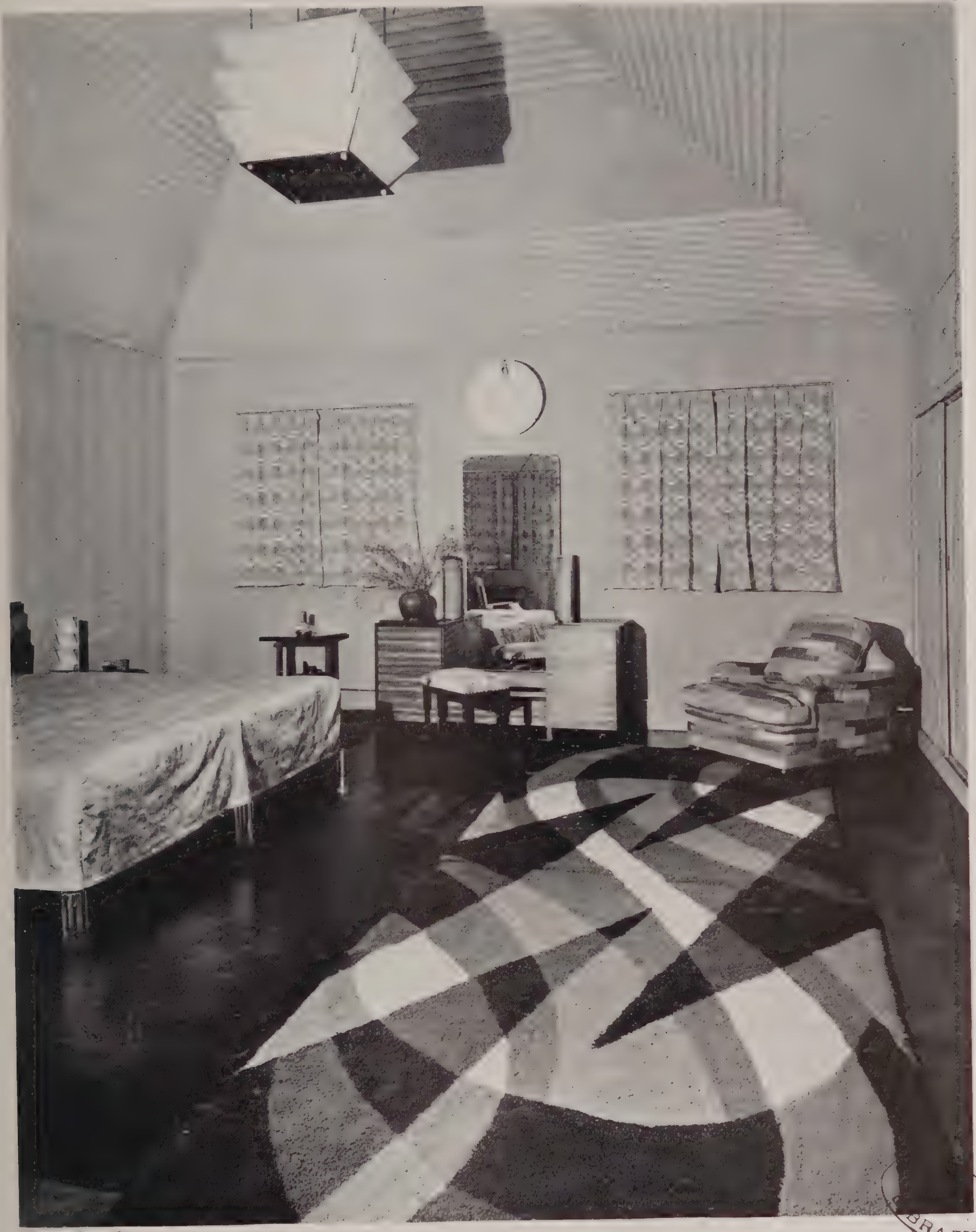


DETAIL AND PLAN: THE ORANGERIE, WYE HOUSE, TALBOT COUNTY, MD.
FROM A MEASURED DRAWING BY J. DONNELL TILGHMAN



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Guest Room, House of James L. Breese, Esq., Southampton, N. Y. Architecture and Furniture by Herbert Lippmann. Decorations by Francis T. Miller, Inc.

Architectural Treatment. Ceilings: Natural Gray, Plain and Corrugated Asbestos Material; Ceiling Made Into Truncated Square; Plain Pyramid Under Slope of Roof. Walls: Covered with Natural Colored Patterned Jute. Windows and Doors: Chromium Plated Brass Bars Around Windows and Doors and Above Base, Jute Nailing Covered by These Bars; and on Doors Themselves. The Jute Ends Also are Covered by Chromium Plated Brass Angles. Flooring: Three Shades of Cork Composition Tile with Narrow Borders and Field Designed Paralleling Beds. Mirrors have Monel Metal Frames and Ground Glass Below to Provide Lighting. The Wood Shelves are Lacquered Black.

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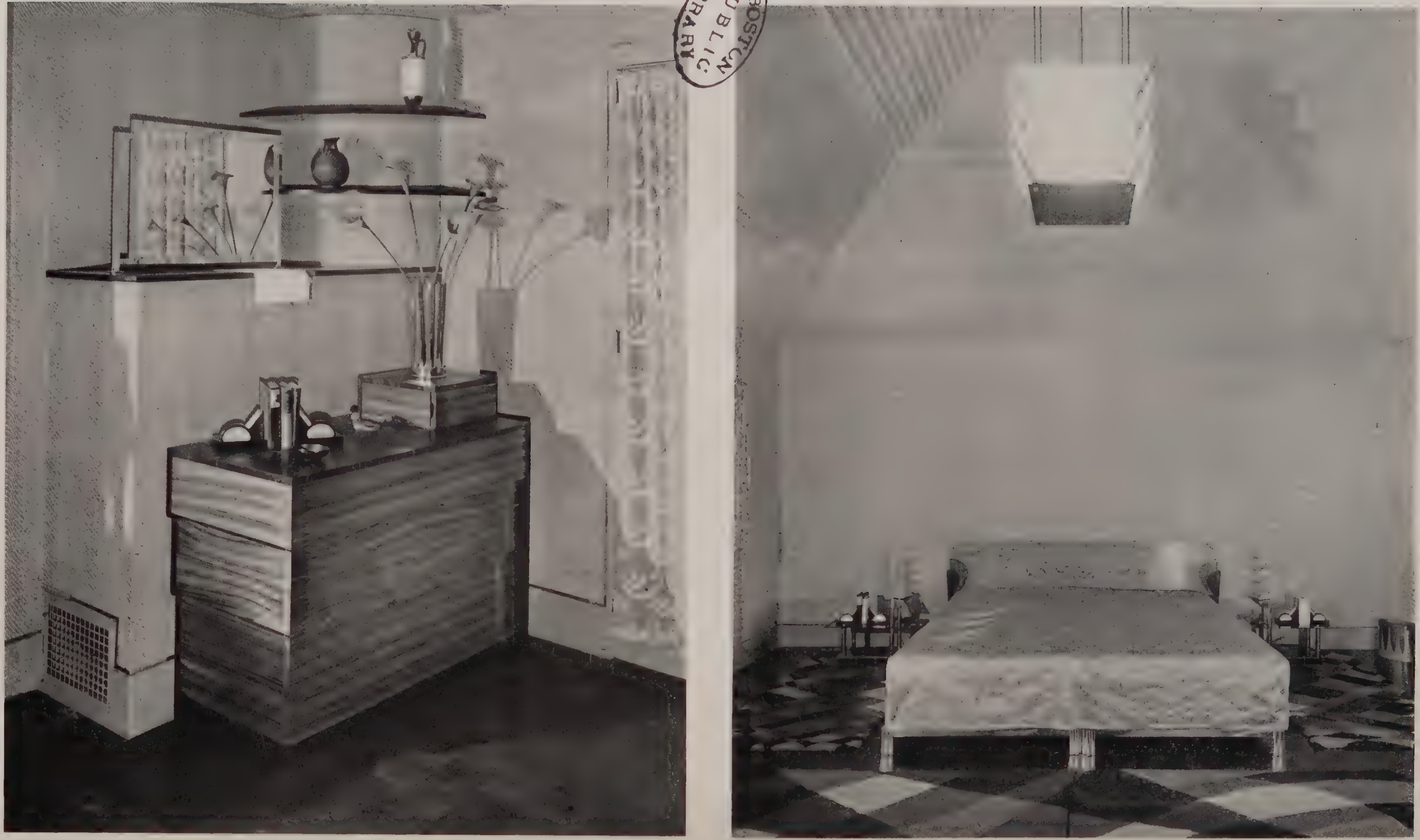

Guest Room, House of James L. Breese, Esq., Southampton, N. Y. Architecture and Furniture by Herbert Lippmann. Decorations by Francis T. Miller, Inc. Furniture: Beds, Separate Head-board Hooked to Wall, Veneered with Tamo, Walnut and Macassar Ebony; Bed Frames of Standard Brass Angles and Round Bars, All Chromium Plated. Woman's Dresser, with Mirrors, Lights, Drawers, Tray; Veneered with Zebra Wood and Rosewood, No Projecting Draw-pulls. Finger Grooves in Scalloped Pattern on Edges of Drawer Fronts. Man's Dresser, with Top Jewel Drawer, Veneered with Zebra Wood and Rosewood; No Projecting Draw-pulls, as Drawers Set Forward Over One Another and Finger Grooves are Under Projections. Hand-hooked Rugs. Stool Upholstered in Unborn-Calf Skin; Curtains, Embroidered Ecru Net; Bedspread, Embroidered Ecru Silk, Quilted Effect.

7, a.

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IN TWO PARTS

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PART TWO

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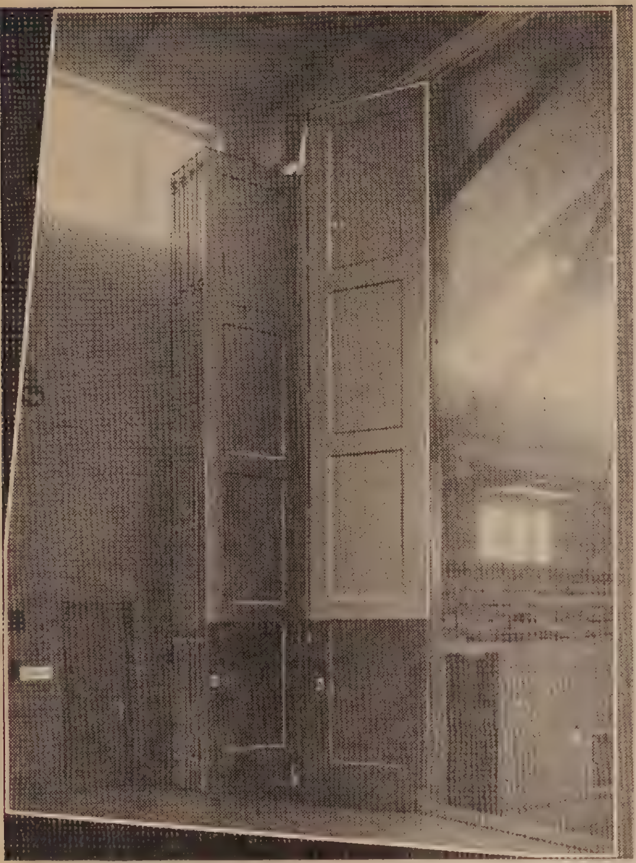
1929



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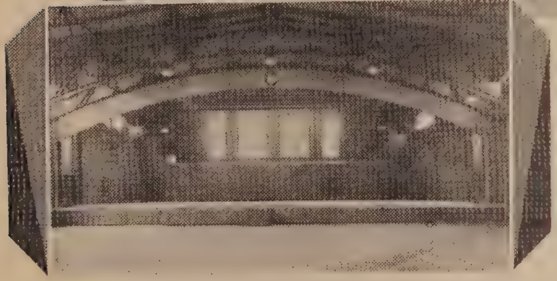

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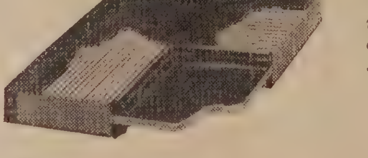

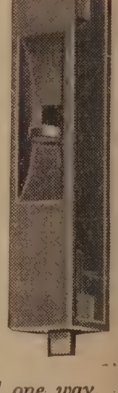

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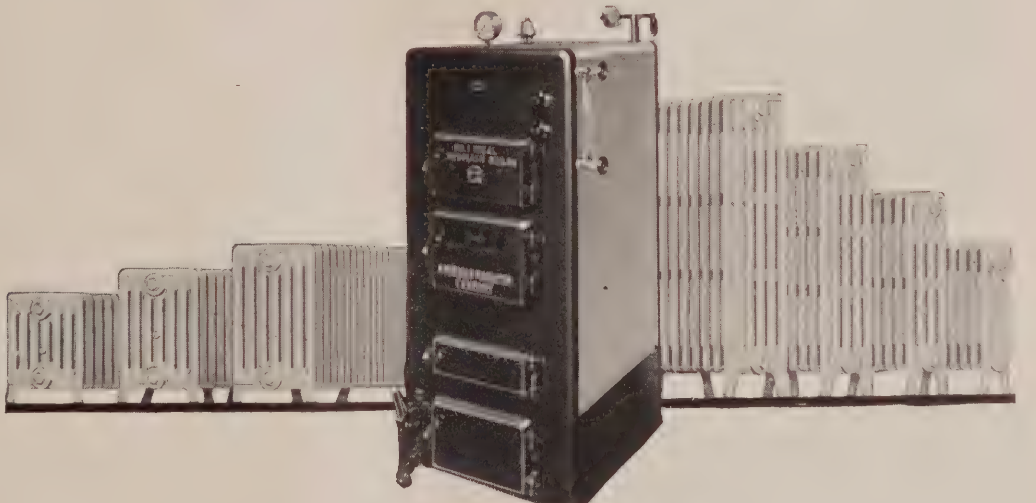

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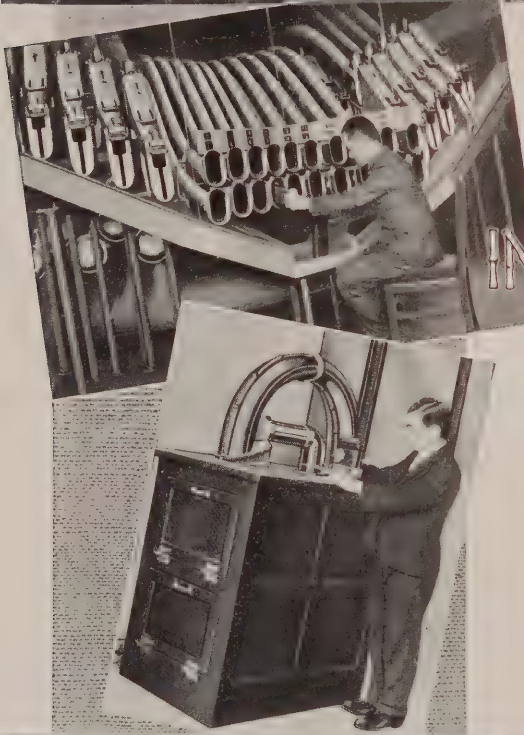

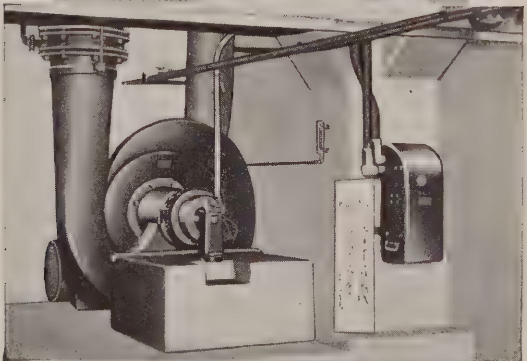

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BOOK DEPARTMENT

ROADSIDE DEVELOPMENT

A REVIEW BY

WALTER KNIGHT COLE

THE American people are spending an ever-increasing portion of their leisure time in the open, along the highways and byways which form a network over the entire expanse of the country. Automobiles are constantly carrying countless millions to and fro, and the natural and artificial features that form the surroundings of these roads are bound to have at least a subconscious effect on the spirits and minds of those who spend such a large portion of their time traveling the roads or resting along the roadsides. It might be said that the great system of roads in America forms an outdoor home for the people, and that as much attention should be given to beautifying and maintaining the surroundings of the outdoor part of the home as is given to the decorating of actual dwellings. It is quite certain that the automobile and good roads have had a very definite effect on domestic architecture. It is no longer so important to provide broad porches and other places where the householder may spend all his leisure time, since it is more than likely that he will have very little time to devote to staying at home, especially if he has available roads whose surroundings are not only pleasing to the eye but also furnish all sorts of utilities for his convenience and pleasure.

A Grade Separation, Tuckahoe Road, Bronx River Parkway, New York

Of course the part of the road that is of paramount importance to the traveler is the roadway itself. It is more important to have a broad, smooth driveway than it is to have elaborate landscaping surrounding a rough and inferior pavement. However, if it is possible to have both a fine roadway and pleasant, tasteful surroundings, the effect on the mind of the stranger is favorable, and he is filled with respect and liking for the inhabitants of the country through which he is passing. Often it is only necessary to take advantage of the natural beauty of the terrain along the right-of-way in which the new roadway has been built. By cutting the grass, cleaning up underbrush and grading off the shoulders of the road as well as of any cuts or fills made during its construction, the general effect of prosperity and good will may be increased to a surprising degree. Then, too, there are instances where the natural features need to be augmented by the planting of nursery trees or shrubbery. This may be done according to either a formal or an informal plan, depending upon the nature of the countryside or suburban district through which the road is passing. Public utility lines which run along roads are seldom assets to the beauty of the surroundings, but their objectionable features may be reduced to a minimum by careful planning and designing on the part of representatives of the companies and the men responsible for layout of roads, and this should be done.

Other features which have a lasting effect on the beauty of the surroundings include, of course, the design and construction of the engineering structures built in connection with road construction, such as bridges and culverts. It is in this department of road building that architects are most likely to be interested, since they are often called in to consult and collaborate with engineers in the designing of such structures. This type of design offers an opportunity for the beautifying of the road system. Beautiful bridges have always thrilled the human mind and will probably continue to do so as long as they continue to be beautiful. Even smaller culverts and their parapets should be carefully designed from an æsthetic point of view if the utmost in beauty of the roadside is to be attained.

Another type of roadside accessory in which architects have a professional interest is the convenience stations that are being placed along the highways at intervals to serve the traveling public. This type of building has been receiving considerable attention of late, and some very interesting and charming bits of architecture have been designed to serve these purposes. Service stations for the sale of supplies to automobilists of course are more often than not hideous blots on the landscape, being designed to attract attention to themselves rather than to beautify the scene. Some of the large gasolene dispensing companies have evidently made some efforts in the direction of building more pleasing stations, but the commercial urge has in most cases been too strong, and beauty has suffered accordingly. In some cases where comprehensively planned road developments, have

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been laid out, the governing authorities or commissions have kept control of the construction of such gas stations, with the result that they are pleasing adjuncts to the landscape. A good example of this is the Hutchinson River Parkway of the Westchester County (N. Y.) Parkway system, where only one or two stations have been built in the entire length of the road. These stations have been carefully planned to fit in well with their surroundings, and in this their architect has been quite successful, but it is the exception proving the rule.

One of the leading road development systems in America,—if not the leading system,—is that Wayne County, Mich., which is famous the country over for its splendid roads running through right-of-way carefully kept and improved. One of the men who have helped to bring about this excellent system of roads has made a careful investigation of the subject of roadside development and has published the results in book form. This is J. M. Bennett, Superintendent of Parks and Forestry, Board of County Road Commissioners, Wayne County, Mich., and the work, entitled "Roadside Development," is issued as one of the "Land Economics Series." The author's long experience in the planning and developing of roadside development in one of the outstanding programs carried out in America fits him well to compile a manual governing this sort of work. The data given in connection with the various descriptions and discussions have been taken from the records in connection with the construction of these Michigan roads.

A great deal will be found in these pages to interest the architectural reader, especially if he or she be interested in solving landscaping problems. The architect doing general work is often called upon to solve problems having to do with drives and roadways approaching houses or public building he is designing, as well as the leading in of lines of wires and pipes supplying public utilities to buildings. While the chapter here devoted to the designing and construction of the roadway, both as to itself and in connection with trees and poles along its side, was written for use in connection with the construction of public roads, there are many facts and suggestions that should prove helpful to those planning private roadways. Planting is a subject which is of course of prime interest to the landscape architect, and the general discussion of the subject contained in this work will no doubt present to landscape architects many new ideas and theories, based as it is on an experience having to do with the planting of thousands of shrubs and trees in a climate which is typical of a large portion of the more thickly settled region of the United States.

Nor has the author confined himself to trees suitable to his native Michigan but has included in his investigations and descriptions trees suitable for roadside planting in all parts of the country. The actual planting methods employed by an organization having to do with planting on such a vast scale will be found of great practical interest to all interested in beautifying their natural surroundings. The chapters on planting materials, planting and seeding and sodding, will be of course interesting to architects only in a general way, as are also the chapters on the maintenance and preservation of trees. The chapter on comfort stations, however, treats a subject which may well become of interest to at least some members of the profession. In fact, the construction of public comfort stations along public highways has become

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For his chapter on Parkways, Mr. Bennett has come east and draws much of his reference matter from the reports of the chief engineer of the Westchester County Park Commission, whose system of parkways is world famous. Many photographs used for illustrating this chapter and others were taken along the Westchester County roads, and these together with a large number from Wayne County, Mich., and some from various other parts of the county lend greatly to the interest of the book; layouts of trees and roads and other technical matters are illustrated by maps and diagrams, adding to the lucidity of the explanations. The designing of lamp posts is another subject discussed and illustrated that will have more than usual interest for the architect, this compromise between utility and beauty being something that one may be called upon to design in connection with other work. They offer a fine opportunity for original treatment, and as a general thing there is an opportunity for improvement in the appearance of the light standards that line our streets and roads. There is a strong tendency toward extending systems of road lighting across country along all the more thickly traveled roads, and it is to be hoped that those in charge of the construction will employ designers competent to produce pleasing standards that will fit well into the surrounding scenes.

Although this work was obviously written to serve those who are concerned with public road construction and beautification, the architectural reader will be able to glean a great deal of interesting and practical information from its pages, to say nothing of the wealth of material as interesting to him as to a general reader. The description of the progress that has been made throughout the nation will give an idea to what an extent road building developments have been undertaken and carried on. In the appendices will be found reprints of the New York Parkway Law and the laws of New Jersey relating to roadside development and shade trees.

ROADSIDE DEVELOPMENT. By J. M. Bennett. 265 pp., 5½ x 7¾ ins. Price $5. The Macmillan Company, 60 Fifth Avenue, New York.

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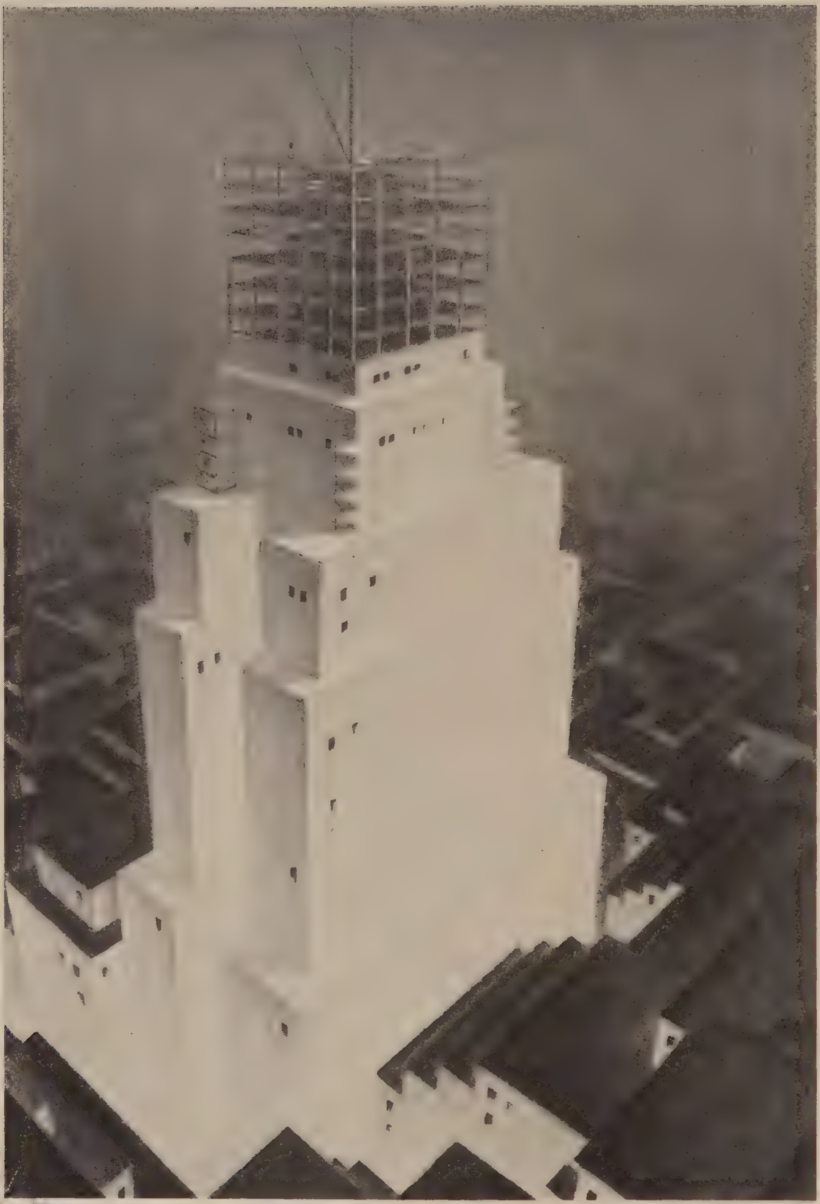


BUILDING THE TOWER

From a Drawing by Tabu

THE
ARCHITECTURAL
FORUM

VOLUME LI NUMBER FIVE

NOVEMBER 1929

◆

ACOUSTICS OF PICTURE THEATERS

BY

CLIFFORD M. SWAN

THE telephone rings. "Long distance calling. Smithtown, Palatial Theatre. New installation of talking picture a failure owing to bad acoustics. Advice necessary at once or house must close." Such is the typical S.O.S. call for help. It has been so frequent since the inception of the so-called "sound films" that it is of interest to analyze the causes and see how they can be corrected.

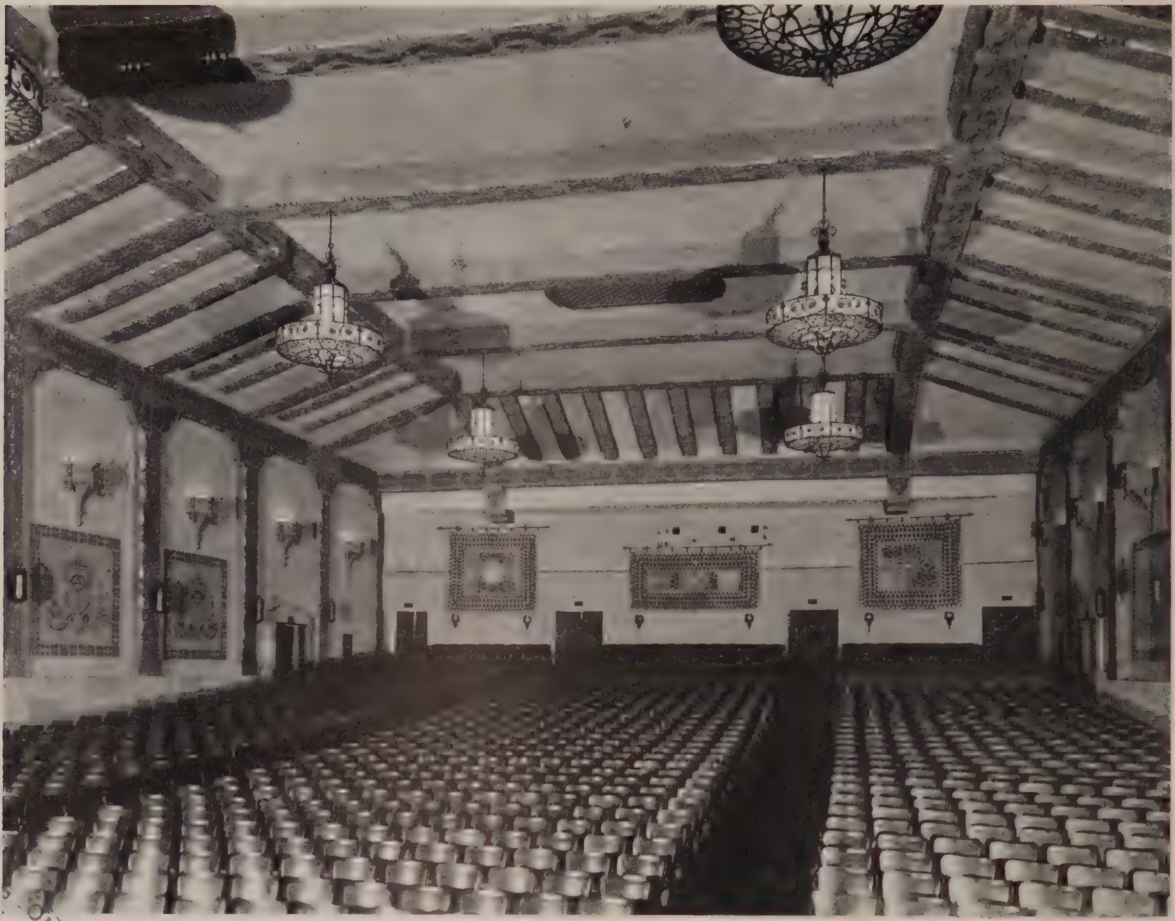
Of course, the general features of the case are not new, since acoustical qualities have long been studied not only in theaters but in all types of auditoriums. The problem becomes insistent under present conditions, however, for two major reasons. One is the fact that most of the theaters now used for talking pictures were originally designed only for the "silent drama," so that the question of hearing was not a matter to consider. The other reason is the great increase in the volume of sound developed as compared with the intensity normally given by the unaided voice or musical instruments, thus calling for a lower reverberation period than in the ordinary auditorium.

Another important consideration, added to the factors of design and reverberation, is the proper placing and operation of the sound-projectors, more often overlooked than one would think possible. Finally there is the disturbing effect of noise of ventilating fans, projection machines and other sources inside and outside of the theater.

Reverberation. First of all, let us consider reverberation, since this phenomenon has become fairly familiar in its general aspects in recent years through much discussion and advertising. Reverberation is the duration or persistence of sound in a room after the source has ceased to give out energy. It is caused by the multiple reflection of the sound waves from one surface to another before their energy is absorbed. Obviously, the more absorbent the surfaces the less time the sound will take to die away. On the other hand, if the surfaces are good sound reflectors, the period of duration may amount to a number of seconds. The effect of the latter condition is to cause a confused jumble of sound whenever words or musical tones are produced in rapid succession. This is increased with the size of the room and the loudness of the originating sounds and is much worse for speech than for music.

Omitting for the moment consideration of metropolitan picture houses which have a considerable amount of absorption due to carpets, hangings and upholstered seats, let us look at the condition of the large majority of motion picture theaters, especially in suburban or country districts. Many of them are mere barren halls with plaster walls and ceiling, wood or concrete floors, and bare wood seats. The only absorption is supplied by the clothing of the audience, and this is often confined to the floor, since there is frequently no gallery, or at best only a shallow balcony.

The absence of furnishings or other absorptive materials is not noticed as long as these houses are used only for silent pictures, but as soon as sound pictures are introduced, trouble immediately looms large. Reverberation, created not only by the very existence of sound but accentuated by the high level of intensity, makes conditions almost intolerable. Intelligibility becomes so imperfect as a result of the overlapping and blurring that the public refuses to be attracted, even by the novelty of the talking feature. Under such circumstances, obviously demanding prompt action, relief has naturally been sought in the placing of absorbent materials somewhere in the auditorium. This is often done in random fashion without due regard either to the amount of material necessary to produce the best degree of reverberation or to its location as influenced by the shape of the room. For these reasons, the results of such blind procedure are sometimes disappointing. Likewise, in the more richly furnished city theaters, where conditions are apparently satisfac-



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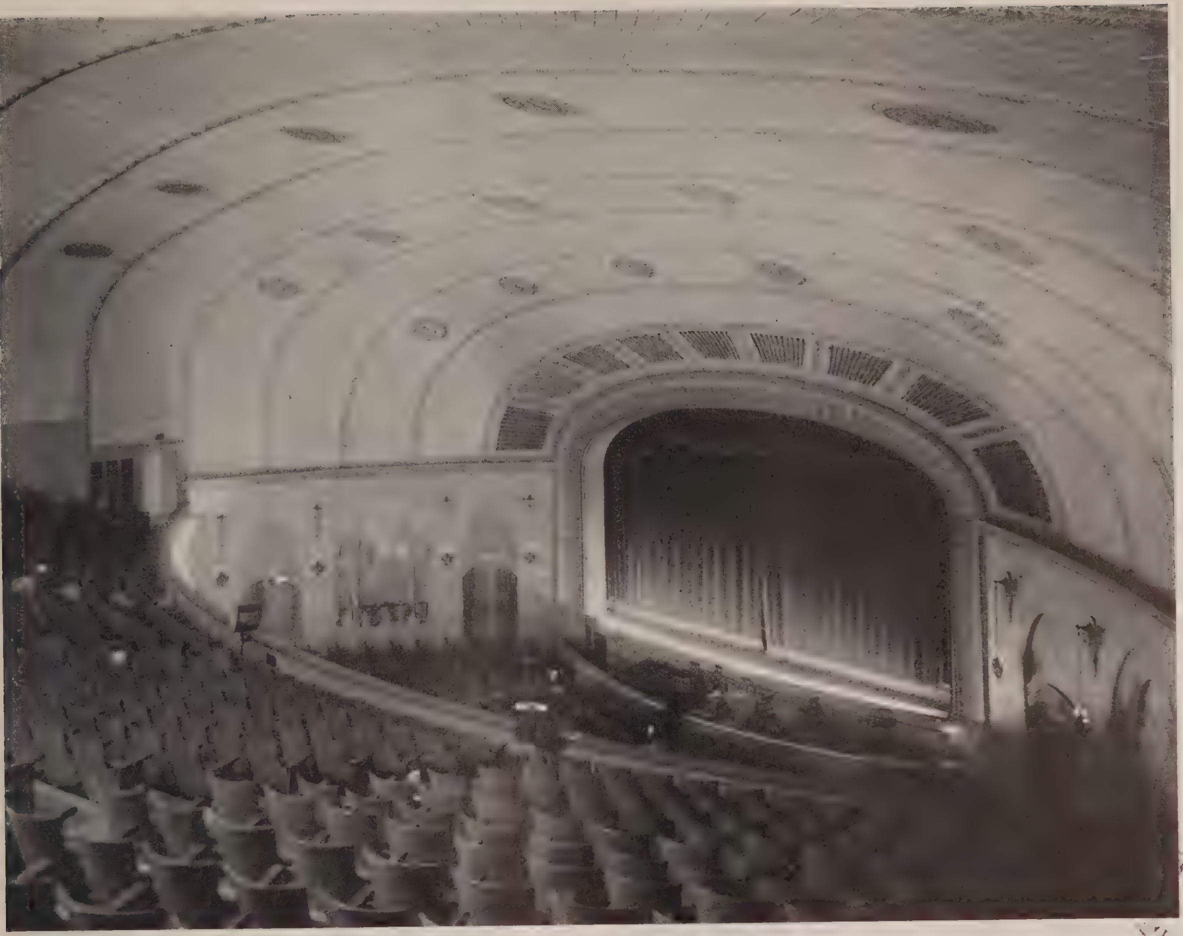
Typical Theater Without Balcony, Showing Necessary Rear Wall Treatment to Prevent Echo, as Well as Ceiling Treatment to Reduce Reverberation

tory for ordinary speech or music, the amount and disposition of the absorption are not always the best for the new type of sound origin.

As the result of some 30 years of experience in the adjustment of auditorium acoustics, the optimum time of reverberation has been fairly definitely established for varying sizes of rooms as used for speaking or for instrumental or vocal music. In the normal auditorium there must always be some reverberation to preserve tone quality and sufficient loudness to hear comfortably. On the other hand, excessive blurring must be eliminated. The optimum period represents the compromise of the average ear between these requirements. If we take an auditorium which has thus been adjusted for normal source intensities and then substitute a source many times louder, as in the case of the amplified reproduction in talking pictures, the time of reverberation is materially increased. This means that additional absorption must be introduced to restore the reverberation period to the optimum value. Exact figures are difficult to give because the sound reproduction is not always presented at the same level of intensity. On the average, however, the talking picture house requires about from 20 to 25 per cent more absorption than if used for unamplified speech.

The actual area to be covered by any given absorptive material will be obtained from the number of absorption units as just outlined and the absorption coefficient of the material chosen. Sound-absorbing materials may vary widely in their efficiency over the range of audible pitch, and different materials have varying efficiencies. For the most perfect results, therefore, care should be exercised in the choice of material to be certain it will meet the requirements of the case, not only a single pitch, but over the entire range.

Location of Absorbing Materials. Of equal importance with the amount and kind of material chosen is its location. Indeed, its apparent absorption and its consequent effect upon the reverberation are dependent to some extent on its position. Furthermore, reflection from some surfaces is more harmful than from others, on account of the production of echoes and dead spots. Such surfaces should receive preferred attention in their treatment. Their location will be largely a question of the design of the individual theater. It may be laid down as a general principle in almost all



Theater with Ceiling Curvature which Would Produce Echoes, Corrected by Using Absorbent Tile Vaulting

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cases, however, that the rear wall of the auditorium should be made as absorptive as possible, and particularly if this wall is devoid of balconies or is curved in shape. In fact, curved surfaces are dangerous wherever located, whether on walls or ceiling. Even plane walls if parallel often produce flutter echoes. The rear wall, however, is of especial importance, since it faces the origin of sound and produces a direct reflection, and the more so if horns are used, since these have a marked directional effect particularly for high pitches, and therefore submit the rear wall to an intensified bombardment of sound. Very deep and low balconies may protect this wall from much of the direct sound, but the average small picture house seldom has this protection. In a large number of theaters the rear wall is segmental, following the curved line of the seat rows and with its center of curvature located somewhere between the front of the orchestra stalls and the rear wall of the stage. This is about the worst possible curve, as it is sure to produce focusing effects. It should be avoided in the design of all new houses. In those already built it must be covered with the most absorbent material possible. Perhaps the best solution as regards appearance and efficiency is to hang heavy interlined curtains in full folds over the offending surface. Other points to remember in designing new theaters are that flat ceilings are preferable, as are plane side walls slightly flaring outward from the stage,—and that sharply curved surfaces of short radius, such as coves and corner curves, are permissible.

Sound Sources. Sound projectors are of two general types, — the disc and the horn. Disc speakers give a better diffusion of sound throughout the theater and consequently a better distribution of intensity. Horns are very commonly used, however, and on account of the directional effect already noted, make particularly imperative a careful study of the shape of the auditorium. Some such sources produce a beam of short waves analogous to a slightly divergent beam from a searchlight. The number and kinds of curious and unexpected echoes which can result from such a wave concentration when combined with a variety of curved walls and a vaulted or domed ceiling are truly remarkable. Since most of the sound from such projectors passes directly ahead, the auditorium should be limited in width—another point to be borne in mind by the architect in new designs. If the theater is wide, sound will reach the front corners and extreme sides largely by reflection alone, and hearing will be difficult.

Another precaution which must be taken, especially with such directional sources, is the arrangement and relative positions of the several horns employed. Many cases arise where the acoustical condition of the auditorium is as nearly perfect as possible, and yet dissatisfaction is found in the hearing, simply because of improper placing of the loud speakers. Ideally, the sound should all proceed from as nearly one point as possible. Wide separation of the projectors,—the more so if they are strongly directional,—almost inevitably causes local regions of confusion in the auditorium due to imperfect registration of the various wave trains as a result of difference in length of path. A solution has been found in concentrating the loud speakers directly behind a picture screen, permitting the passage of sound. The only drawback to this is the partial selective absorption by the screen.

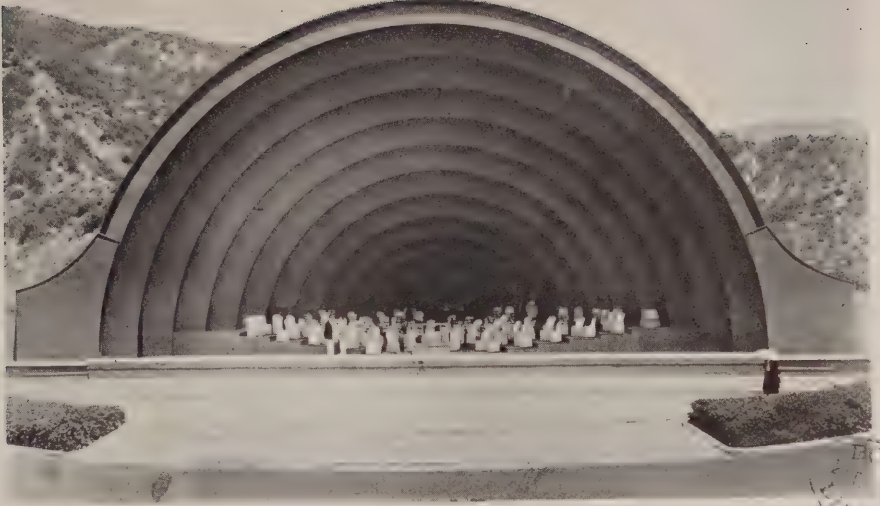
Extraneous Noises. There are still further points to be considered in the production of an auditorium thoroughly comfortable for hearing. These relate to the disturbing effect imposed on the ear by noise originating either inside or outside of the theater. Like dirt, which is said to be matter out of place, so noise is sound out of place. Conversation, which has its legitimate uses under suitable conditions, becomes noise when it interferes with a program of entertainment. The hum of a dynamo may be a musical tone, but it is noise when it intrudes upon desired quiet. The sound of a dance orchestra is often the worst possible noise to one trying to sleep in a nearby apartment. Any sound which interferes with the business at hand must be classed as noise.

In the case of the picture theater, noises may arise from a number of sources,—conversation or movements in lobbies and corridors, the sound of traffic on the street, the whir of ventilating fans, the hum of the motion picture machine, restlessness and coughing in the audience, and sometimes the reverberation of the stage chamber. Of course, the first precaution is to prevent as far as possible the production of such noises. Lobbies should be carpeted or have an absorptive material on the ceiling; aisles and spaces between the rows of seats should be covered with resilient deadening material; ventilating fans, motors and projection machines should be as silent as practicable.

Such noises as remain despite these efforts must be excluded from the auditorium. Doors leading into lobbies should be kept closed. The noise of persons walking and talking in such antechambers, together with the sound of street traffic, is a source of serious annoyance to those of the audience in the rear rows. Effective door barriers are an inestimable comfort. Fans and motors should be located as far as possible from the auditorium, preferably in a basement, but in any case on a rigid, heavy main foundation and mounted on cork. Ducts should be broken by a canvas sleeve near the fan. If noise passes through the air column of the duct, a felt lining should be installed within the duct extending from the canvas sleeve up to and around the first bend in the pipe.

Projection rooms suffer not only from the direct noise from the machines but also from the increasing of this noise by the reverberant interior of the space. Such rooms should always have a fireproof, sound-absorbent material applied to the inside surfaces of their walls and ceilings. In theaters where the stage is large and bare, there may be sufficient reverberation to magnify sound from the loud speakers or other sources. If this is great enough to be annoying, absorbent materials can be introduced to correct the difficulty. In many cases the sound projectors are housed in a horn tower or some similar structure. Of necessity, this must have a certain area of openings to permit of re-circulation. In order to prevent the escape of sound from these openings, the structure should be lined with absorptive material.

Of course, on account of the great loudness of the sound from the horns, the importance of many of the noises here enumerated may have been overemphasized and not appear to be as disturbing as in an ordinary auditorium. Still, they are excitants of the auditory nerves and shoud be eliminated.



THE ORCHESTRA SHELL OF THE HOLLYWOOD BOWL

BY

ARTHUR T. NORTH

AUDITION and vision must be correctly related to an audience to produce a complete presentation thereto. Both of these aims can be effected in enclosed spaces by well established methods, but securing good audition in open spaces has been a difficult problem to solve. The rapidly increasing number of outdoor auditoriums makes the securing of satisfactory audition a matter of prime importance. This problem has been solved successfully in the Hollywood Bowl by the use of an orchestra shell of unusual design.

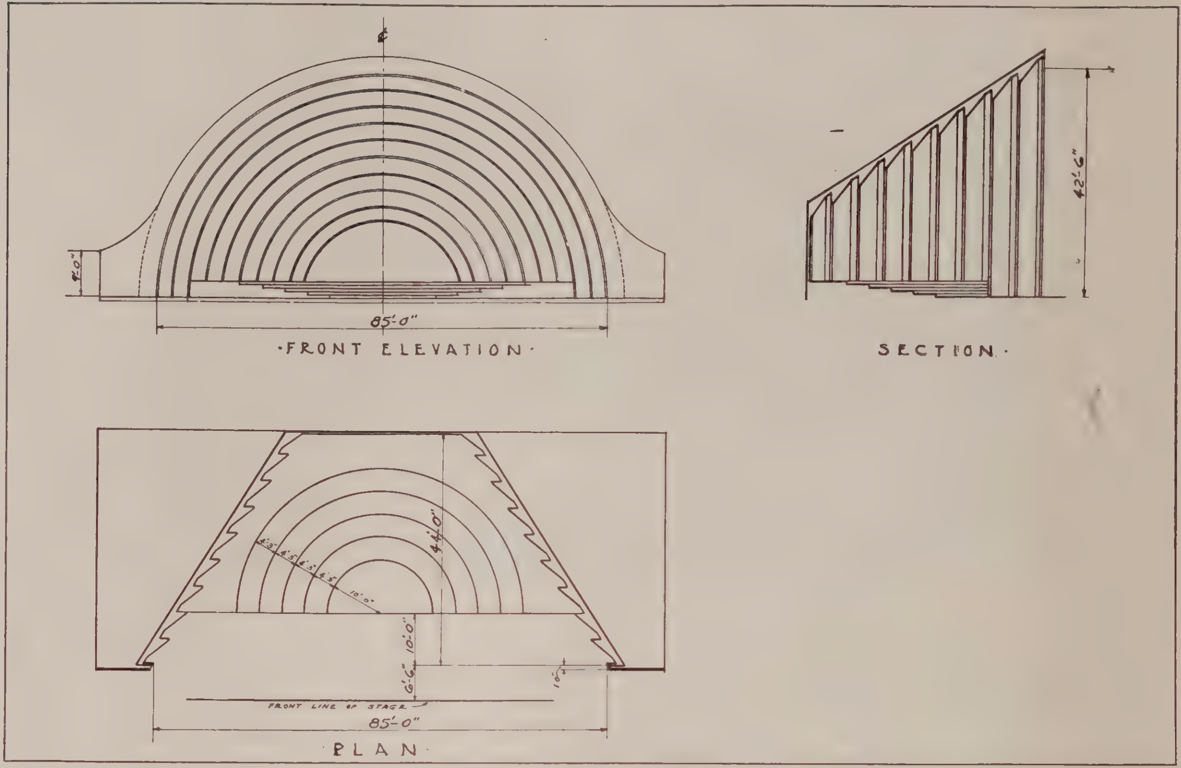
The Hollywood Bowl consists of a seated area built on a sloping hillside extending 550 feet from the stage which is placed at the lowest level. Opposite the seated area there is a corresponding hillside. The stage is 45 x 105 feet in size and is used several times a year for the presentation of elaborate pageants. At other times it is used for orchestral concerts, so the necessity for perfect audition is readily apparent.

The present orchestra acoustical shell is a steel frame structure erected on a movable steel frame floor system which is fitted with forty-seven 6-inch in diameter, double-flange, roller-bearing cast iron wheels which travel on five lines of 30-pound rails. With clips and cap screws the rails are attached to inserts built into the stage floor. When the orchestra shell is not in use, it is removed and the rails are taken up, leaving a flush stage floor. The framework of the shell is made of nine semicircular lattice steel trusses supported on the movable floor framework. The trusses are concentric, spaced about 4 feet apart and having decreasing spans. The weight of the shell and platform, without the walls and roof of the dressing and instrument rooms, is approximately 55 tons. The weight of the structural steel is 36 tons. The entire structural steel work was welded.

The flooring of the shell is made of wood, and the steel frame is covered inside and outside with flat, dense asbestos board sheets. A curtain is used to close the shell against the weather when not in use. It is made in two pieces, fastened along its lower edge, and it opens and closes like a folding fan. Wheels fastened to the curtain operate in a track attached to the outer perimeter of the front of the shell. It is operated by an endless cable and a hand winch located in the left wing. During performances the curtain is stored in a box, the cover of which forms the front portion of the stage.

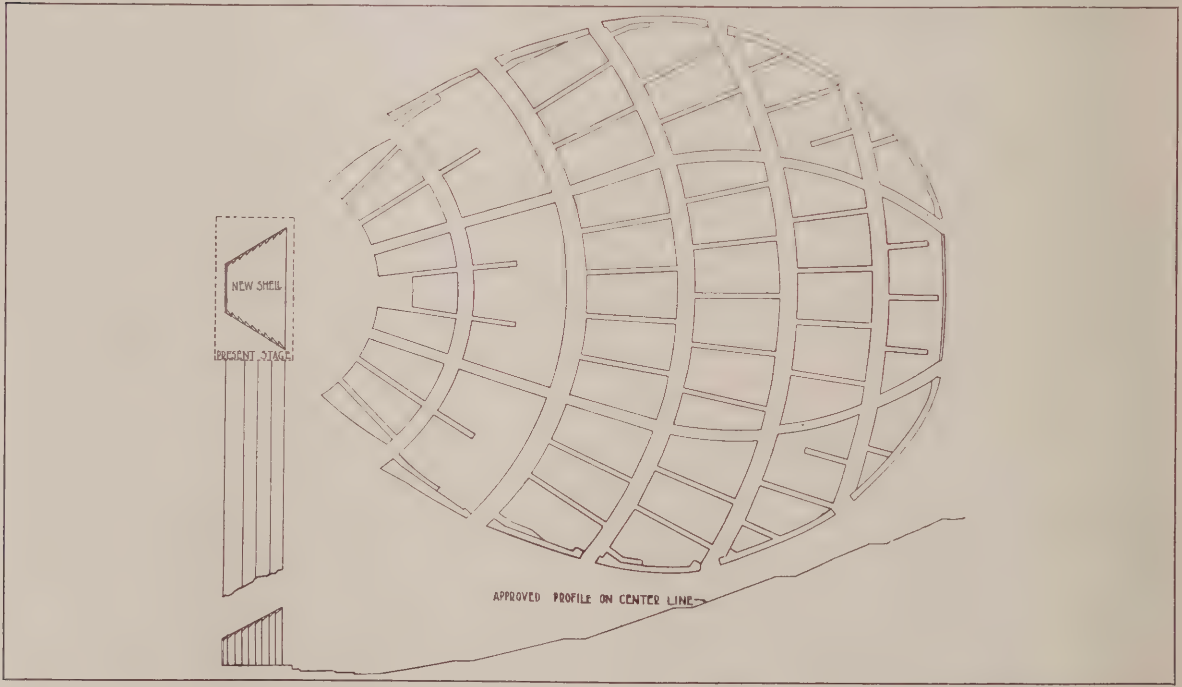
The maximum distance at which ordinary unamplified speech can be heard effectively in the open is generally accepted to be from 100 to 150 feet from the sound source. Sound will carry to much greater distances, however, when good sound-reflecting surfaces are placed behind and at the sides of the speaker. This principle of sound-reinforcing by reflection is applicable to all kinds of music, including that of an orchestra.

The most simple type of orchestra shell consists of a highly reflective vertical wall placed directly behind the orchestra. Such a wall or sounding-

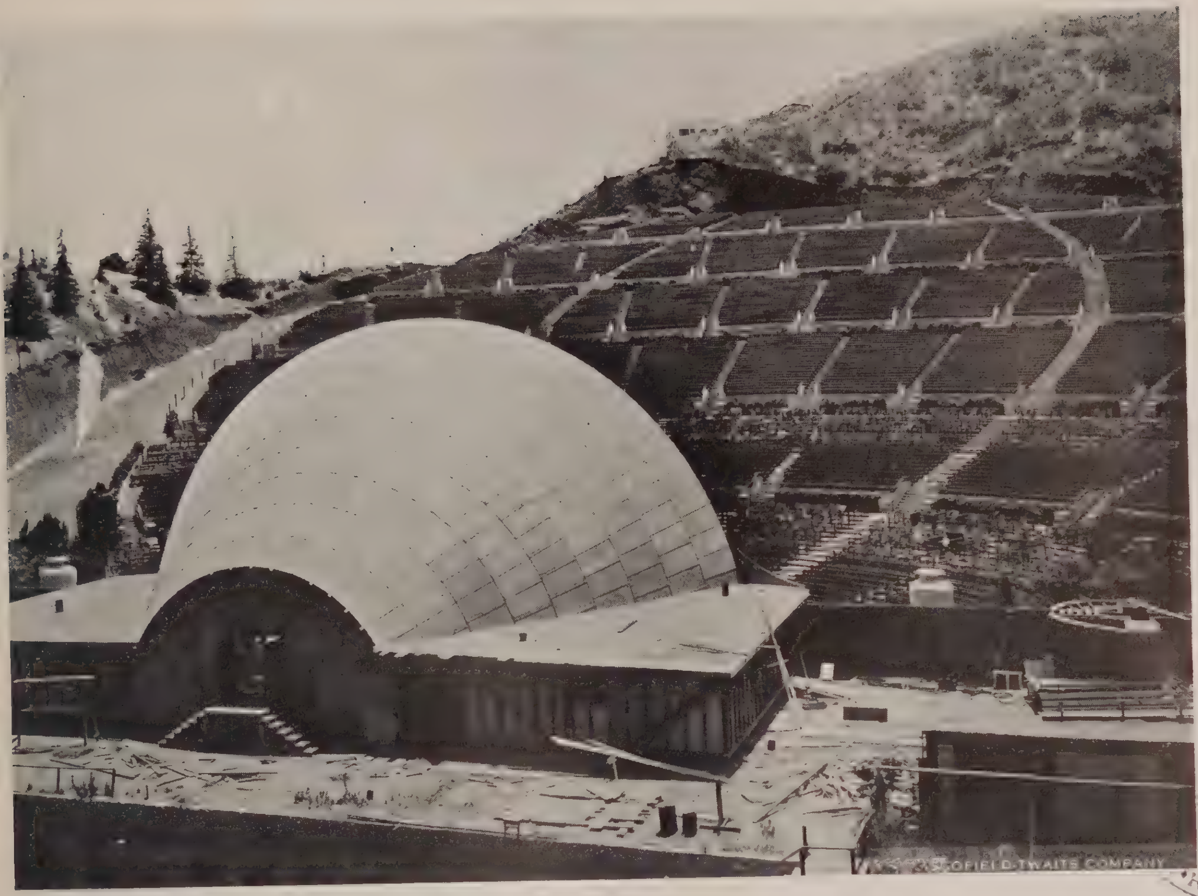


Plan and Sections of the Orchestra Shell

board would approximately double the intensity of the sound projected to the audience. The effectiveness of such a simple type of orchestra shell is greatly enhanced by an overhead reflecting surface. When this overhead sound-reflecting surface is placed at an angle of approximately 45 degrees above the horizontal, it would be suitable for projecting sound to an audience seated on a level area and at the same elevation as the orchestra. A seated area which is inclined and rises from the



Plan and Profile of the Hollywood Bowl, Showing the Orchestra Shell



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View of the Orchestra Shell and the Bowl

orchestra level necessitates having an angle of the overhead reflecting surface greater than 45 degrees.

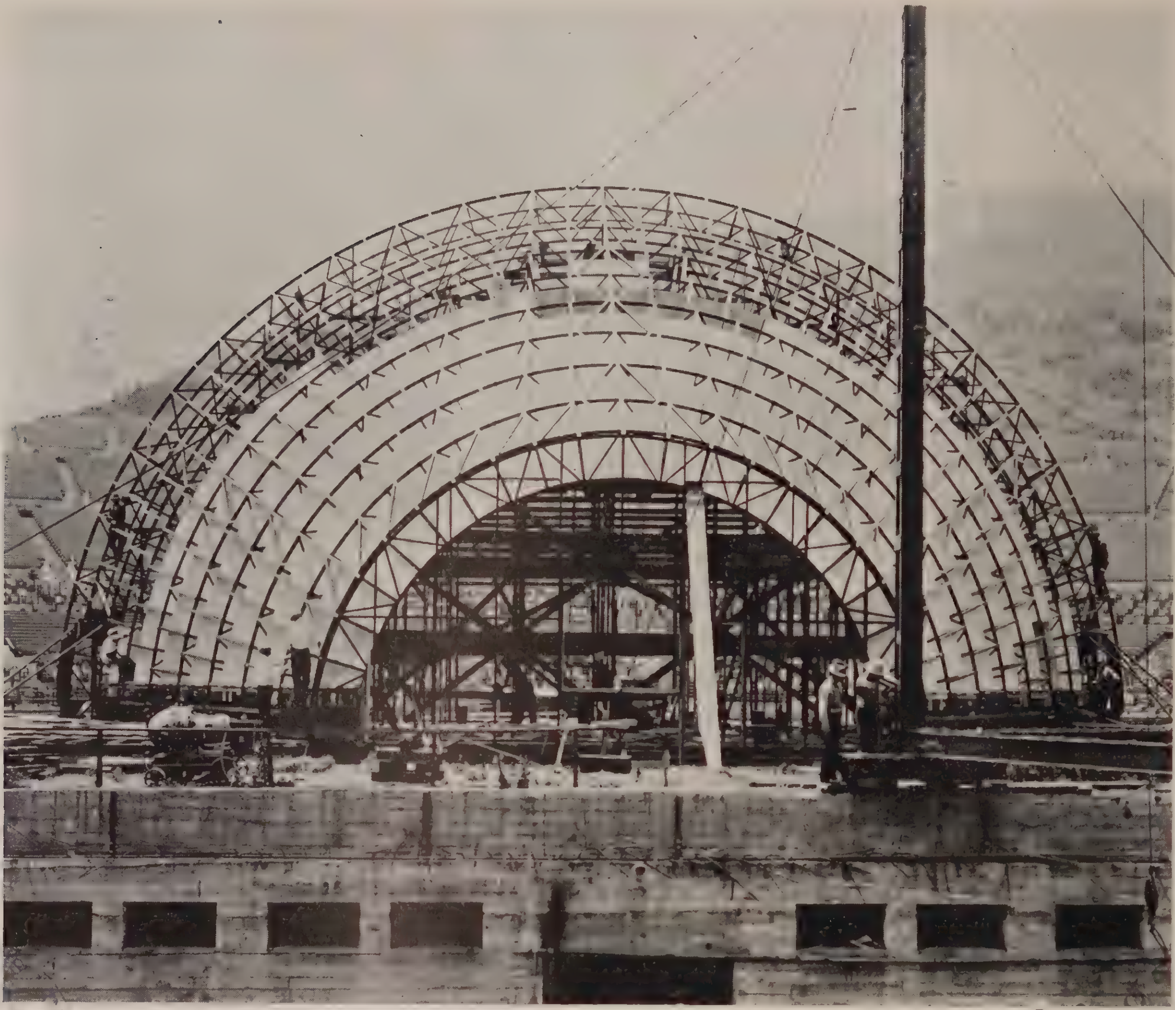
The seated area of the Hollywood Bowl is inclined at an angle of about 12 degrees above the horizontal. The last tier of seats, 550 feet from the stage, would be about 115 feet above its level. This condition requires the overhead reflecting surface to be pitched at an angle of about 51 degrees above the horizontal. With the overhead reflecting surface pitched at this angle the sound which rises vertically from the orchestra will be projected parallel to the slope of the seated area.

Vertical and inclined reflecting surfaces were placed behind and above the orchestra in one of the first shells constructed at the Hollywood Bowl. A shell constructed later was a combination of vertical walls behind and at the sides of the orchestra with plain parabolic surfaces above the orchestra. Although this shell gave a strong reinforcement to the sound, it was unsatisfactory because it produced an overemphasis of tones of those instruments located near the focal lines of the three overhead parabolic surfaces.

The form of the final design of the permanent orchestra shell is one-half of a truncated right circular cone having an outside radius at the front of 45 feet, 6 inches and of 18 feet at the back. The pitch or slope of the cone is 51 degrees. The structure is made up of a number of concentric reflecting surfaces. These concentric bands or surfaces prevent the focusing of the sounds of the various instruments. The sounds originating at any point on the orchestra platform in general are directed toward the audience seated in the Bowl with a slight advantage to those seated at great distances from the shell. That portion of the audience which is seated near the shell receives the direct sound waves from the instrument origins without reflection and of adequate intensity.

The primary function of the orchestra shell, which is to project the sound with adequate intensity over the vast seated area, is attained satisfactorily. The shell is free from such customary defects as echoes and sound *foci* and effects a diffused reflection of sound to all parts of the Bowl. The faintest tones of the violin are clearly audible in the most remote seats. The acoustics of the Bowl are enthusiastically praised by musical critics.

That portion of the movable platform outside of and at the rear of the shell is roofed over at the height of 8 feet and enclosed to provide rooms for the directors, soloists, musicians and for instruments. The permanent means for moving the platform and shell have not yet been provided. It



Welded Steel Frame of the Orchestra Shell, Partially Covered

will be moved probably by means of a small hoisting drum and motor located at the far end of the tracks and connected to the movable platform by an endless cable, or it will be moved by a direct attached motor truck or tractor. It is not probable that motive power will be installed on the platform itself.

The designing of the semi-circular steel trusses involved some very complicated calculations. The stress analysis of the arch ribs was made by applying the theory of the deflection of curved beams and the aëro-dynamical theory of wind pressure on a cylinder. Two analyses were made, one for wind and one for dead load stresses. Equations were written and solved for thrust, moment and radial shear and the corresponding curves drawn. It was thus possible to compute easily the maximum flange section required and the size of the web members at various points without the use of the customary stress diagrams.

A rough acoustical test was made when the shell was completed. Listeners were placed at 26 different locations in the Bowl, and one No. 10 bird shot was dropped varying distances onto a kettledrum located near the center of the shell. When dropped a measured distance of 8 inches, the sound was heard over the entire Bowl area. The drop was then decreased and the varying degrees of audibility in the different parts of the Bowl were plotted. It was found that the sound generated by dropping the shot ¼ inch onto the head of the kettledrum could be heard distinctly over three quarters of the Bowl area. Numbers were then whispered from the shell and called back by persons in all parts of the seated area.

In the designing and construction of the orchestra shell, the Hollywood Bowl Association was represented by Professor R. R. Martel, California Institute of Technology, as consulting engineer. The designing and supervising personnel included Messrs. Elliott, Bowen and Walz, consulting engineers; Frank Lloyd Wright, architect, and Dr. Vern O. Knudsen, physicist and consultant on acoustics.

CHILLED AIR DISTRIBUTION IN THEATERS

BY

WILLIAM GOODMAN

MECHANICAL ENGINEER

VENTILATING theaters today has become not only a problem in maintaining the proper temperature and humidity, but also a problem in the proper distribution of the air throughout the house. Warm air drafts on the feet and the back of the neck are unnoticed, but let the air become slightly chilled, and these same drafts become a serious annoyance.

Formerly air was almost universally supplied through "mushrooms" set in the floor. Few mushrooms were provided, and as a result, air passed through these mushrooms at a high velocity. This did not matter with warm air, but when the same system of air introduction was tried with refrigerating plants, another story was told. Most of us have vivid memories of having sat at one time or another over a small gale of vigorously blowing cold air. Today large numbers of mushrooms are used. It is usual to provide a mushroom for every 65 cubic feet of air supplied per minute to the auditorium. With this volume, the air leaving the usual type of mushroom has a velocity of roughly 100 feet per minute. This velocity will not cause serious drafts. However, an abundant supply of mushrooms will not insure a low air velocity unless the air velocity in the tunnels or plenum chamber below is very low. Air shooting down a tunnel at a high velocity means high air velocities through the mushrooms, inasmuch as velocity changes cannot be abruptly made,—a fact which many engineers seem to forget,—and as a result, even systems with sufficient numbers of mushrooms will produce feet drafts. When using a floor supply system, exhaust grilles are provided at various points in the ceiling and balcony soffits. All the exhaust should not be concentrated in one large grille in the center dome. The exhaust system is not only a means of removing air but also of securing a proper distribution of the fresh air by drawing it across portions of the house where it is needed.

As theaters are being designed today, the hottest, stuffiest portions of the auditorium will be found at the rear of the house, in three places: 1. Under the mezzanine boxes. 2. Under the balcony. 3. At the highest points of the balcony. The ceiling heights at these points seldom exceed 12 feet and are more often 10 feet. A vigorous exhaust should be provided at these points, and the exhaust grilles should be placed at intervals across the entire width of the house. Very often it is difficult to work grilles into the design of the balcony soffit or the main ceiling. In that case, it is possible to connect ducts to the hand holes provided for changing the bulbs in the ever-present coves. This is a very convenient expedient and is often resorted to. Where the design consists of large round or octagonal plaques, these can usually be dropped 3 or 4 inches without being visible to the audience, and air can be drawn through the spaces thus provided. The fact that the hottest, stuffiest portions of the usual theater are at the rear of the house under the low ceilings of the balcony soffit and at the high point of the balcony will bear repetition. A liberal amount of air should be exhausted from the balcony soffit and from the rear of the main auditorium ceiling. Hot air clings to the high points of the house, and provision should be made for its removal there.

More recently theaters have begun to use the downward system of air supply. Air is supplied from the main ceiling, from the side walls high above the heads of those in the audience, and from the balcony soffit. The air is exhausted by mushrooms at the floor. This prevents drafts on the feet of those in the audience, but it also has its drawbacks, although as the situation stands now, the downward supply system is superior in the matter of preventing annoying drafts. In introducing air through the main ceiling and through the side walls high above the heads of the audience, little trouble is experienced from drafts inasmuch as the entering air becomes greatly diffused, due to the large number of exhaust mushrooms spaced over the floor.

The greatest difficulty with the downward system is in supplying air at the low points of the auditorium at the rear of the house, under the balcony, and at the high point of the balcony. As has been said before, the ceilings are seldom more than 12 feet above the floor at these points and more often are only 10 feet. To blow air down at these points would be impossible because of the chilly drafts produced. To blow air in horizontally from the rear walls is even worse, for the simple reason that the back of the neck is particularly sensitive to even the gentlest of cool breezes. The same breeze coming from the front and blowing directly into the face would be welcomed. Introducing air from the side walls is good, but owing to the width of modern houses, it is impossible to get a satisfactory distribution of air with a uniform temperature. Probably the best way to introduce air at these points is to blow it in horizontally or at an upward angle at a very low velocity through the

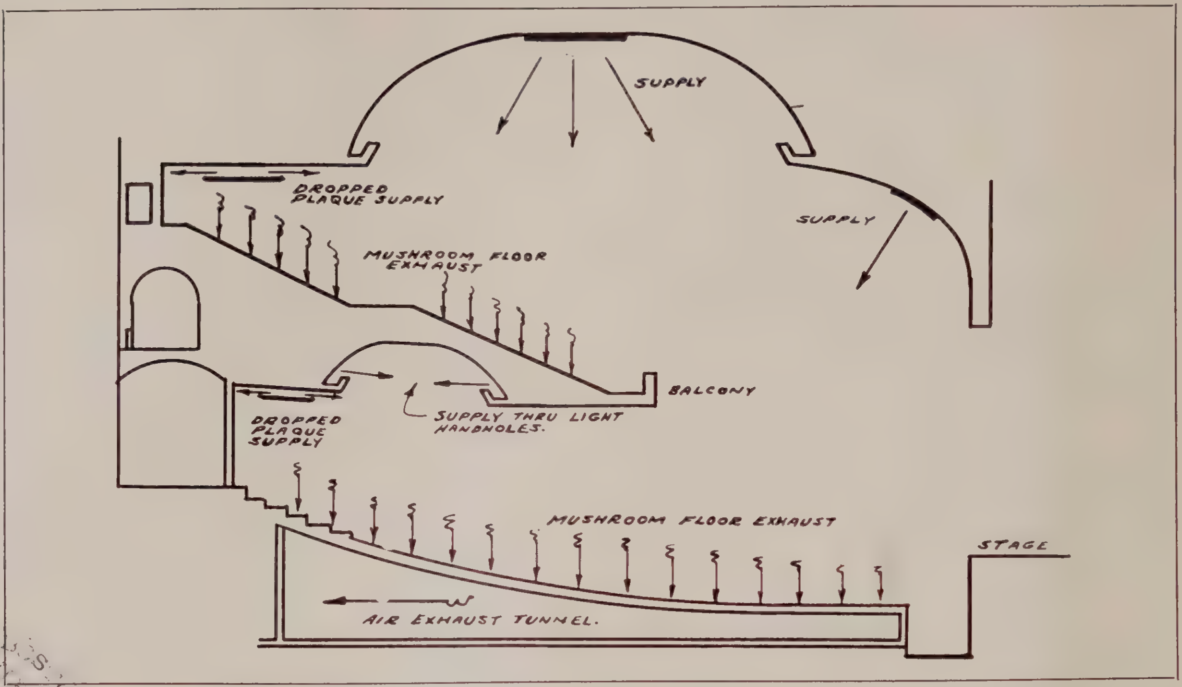
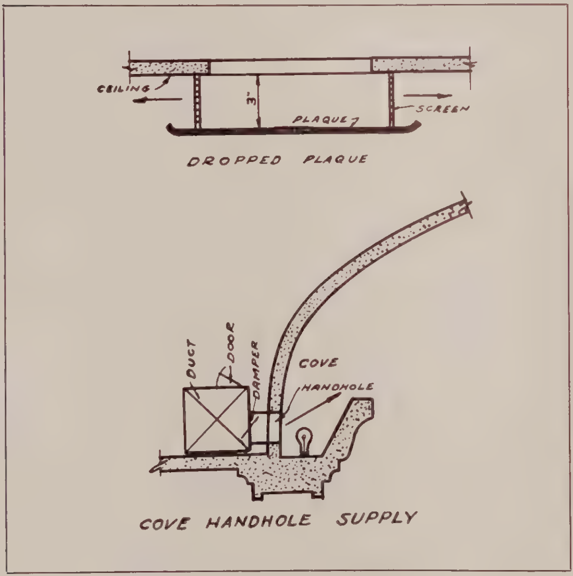


Diagram of the Downward Supply System

hand holes of the light coves. Another way of introducing air horizontally is to use the exhaust scheme previously mentioned,—that is, a ceiling design of ornamental plaques which can be dropped 3 or 4 inches below the remainder of the ceiling. In this way, the air is pretty well diffused before being sucked down by the floor mushrooms. In cases where this is impossible, the only thing to do is to use grilles or liberal areas in the ceiling or soffit and introduce the air at very low velocities. This method is always a gamble. It should be borne in mind that a grille of proper size connected to a duct carrying air at say 700 feet per minute, by means of a 12-inch long transition piece, will invariably deliver the air at the same velocity through a small portion of the grille, while the remaining portions are "dead." Transition or connecting pieces from duct to grille should be long in order to change the velocity gradually and, in addition, the transition piece should be divided into several sections by sheet metal partitions. These partitions should extend from the duct to the grille and will insure a proper distribution of air over the whole surface of the grille, instead of producing a high velocity spot and leaving the remainder of the grille dead. If proper connection is not made from duct to grille in order to reduce the velocity gradually from the duct velocity to the grille velocity, a small high velocity grille may as well be installed in the first place as far as results are concerned.



Two Methods of Providing Supply Outlets

When supplying air from the ceiling there are relatively few points of supply when compared to the number of supply points provided in a floor mushroom supply system. For this reason an exhaust is provided through a liberal number of mushrooms uniformly spaced over the entire main floor and balcony. The chief function of the exhaust system in a downward air supply system is to provide a proper distribution of the incoming air, by its sucking action.

The question of re-circulating the exhaust air is today highly controversial. There are consider-

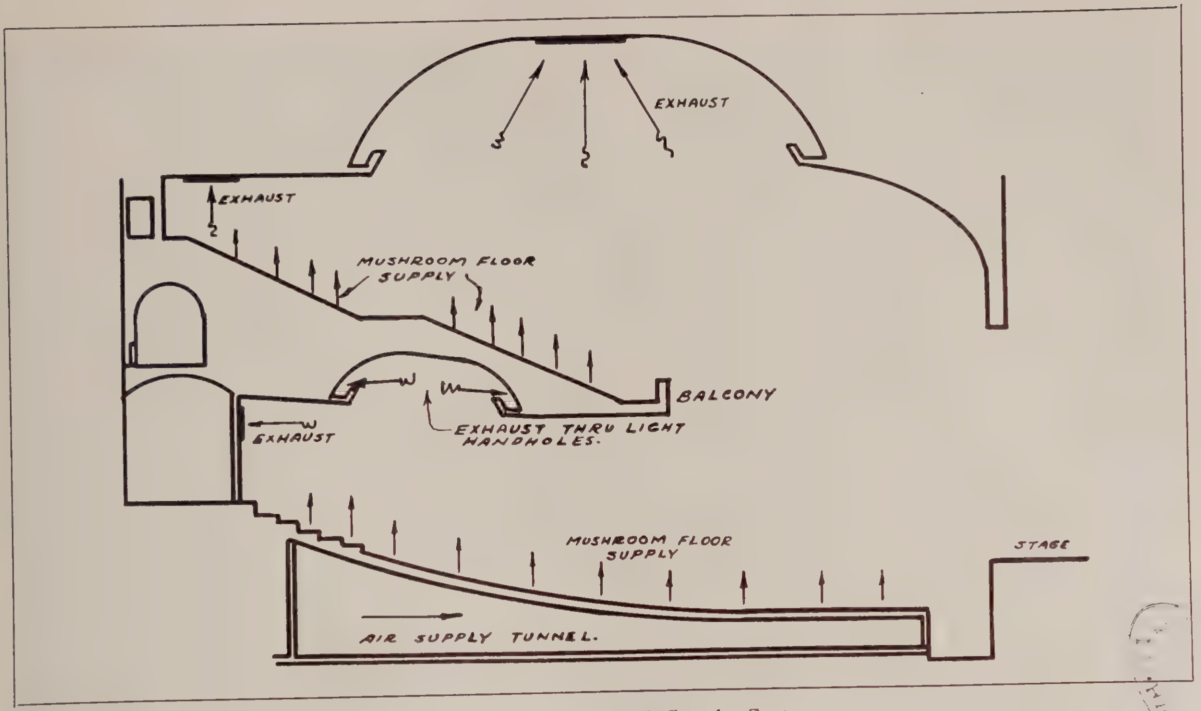
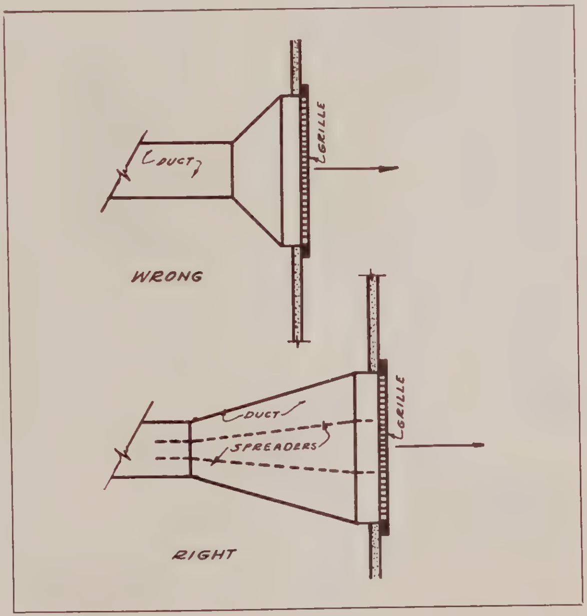


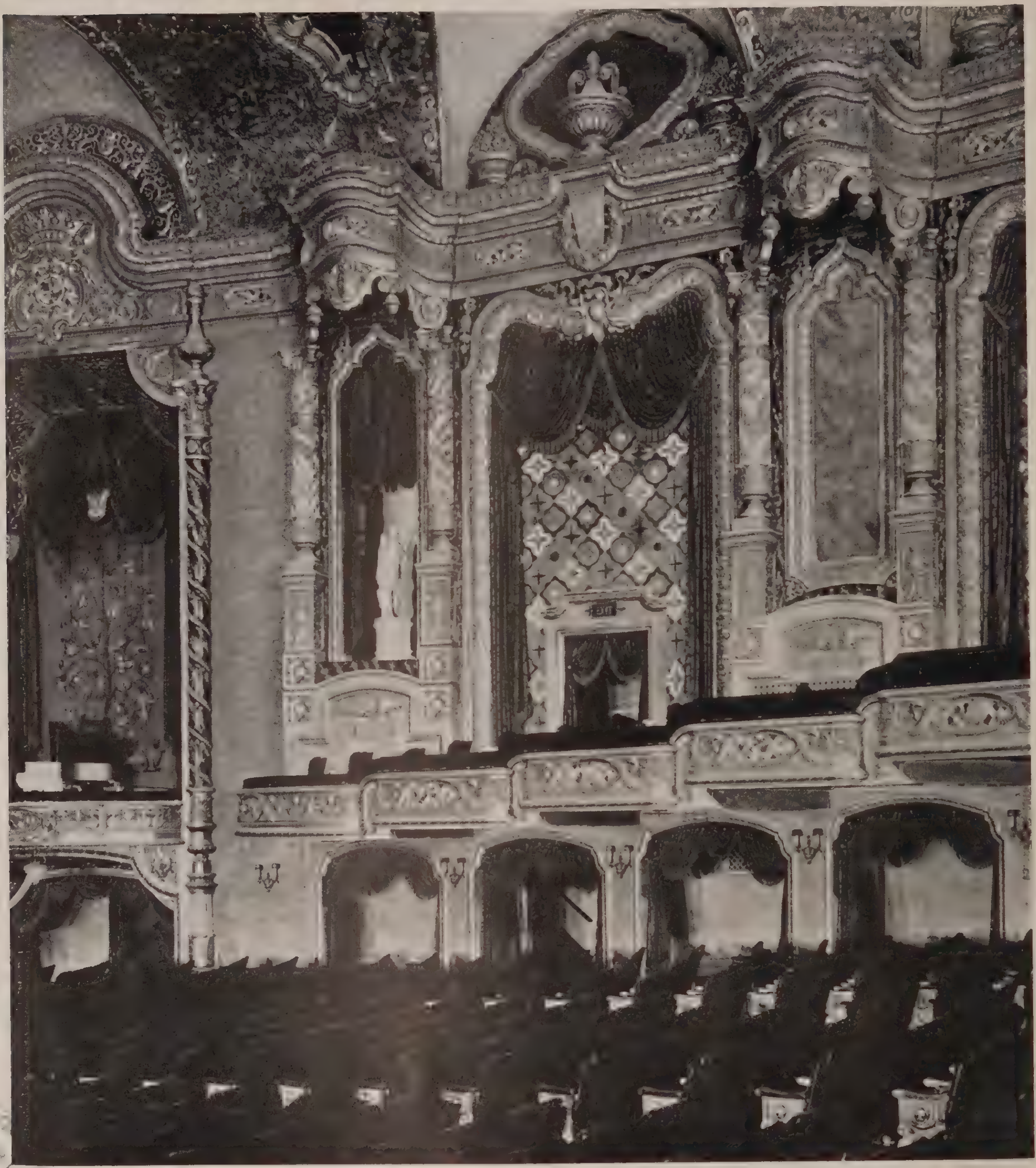
Diagram of the Upward Supply System

able operating savings to be made in both summer and winter by sending back into the auditorium all or part of the exhausted air, after passing it through the air washer. I have stood on the roof of a theater where the air which was being thrown out to the atmosphere was as cool, refreshing and sweet smelling as the fresh air which had just left the air washer, and it was certainly far superior in these qualities to the so-called fresh air which was being sucked into the air intake by the ventilating fan. This intake was located in an alley wall about 10 feet above the alley grade, and the air which was being drawn in was most emphatically lacking in the qualities just mentioned. The air washer and cooling coils perform seeming wonders and give this same air its refreshing qualities. The only doubtful point seems to be in connection with the bacterial content of the exhausted air, but it seems reasonable to suppose that the quantity of bacteria added to the alley air by a theater audience is negligible. The various city authorities as a rule forbid re-circulation, but a certain amount should be allowed. The ventilating system should be made flexible enough so that the exhaust air can be returned to the auditorium through the air washer or thrown to the outside and all fresh air taken in, or else so adjusted that any desired mixture of exhausted and fresh air can be sent into the air washer.

The question of the size of the refrigeration compressor to install is important because these machines are tremendously expensive, a 150-ton machine costing in the neighborhood of $25,000, installed and ready to operate. In Chicago, about ½ B.t.u. is roughly the amount of heat which should be removed from each cubic foot of fresh air, making one ton for every 400 cubic feet of air. No absolute figure can be given because so much depends on the theater itself, the heat gains, the amount of air re-circulated and many other items. For a Chicago theater of about 2,000 seats, a machine of about 150 tons ca-



Right and Wrong Duct Supply Equipment



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The Piccadilly Theater, Chicago, has a Downward System of Chilled Air Distribution
C. W. & George L. Rapp, Architects

pacity would be satisfactory, allowing 25 c.f.m. fresh air per person. The extra tonnage would be used to cool lobby, lounge and foyer air.

All theoretical methods of calculating the tonnage which I have seen published so far give tonnages far in excess of the tonnages actually used to give satisfactory results. The calculation methods are theoretically correct, and the absurdly high results obtained are probably due to using heat gain coefficients and constants which are too high. It should also be borne in mind, that despite the "70 degree" advertisements so often seen outside of theaters and restaurants, no house is ever cooled down more than 10 degrees, or at the most 15 degrees below the outside temperature. If one were to step from a 92° outside temperature to a 70° inside temperature, the shock would be comparable to the feeling one experiences when a cold shower is suddenly turned on. Stepping from a 92° atmosphere into an 80° properly de-humidified atmosphere is surprisingly refreshing and stimulating, however.

ARTIFICIAL MARBLE AND SCAGLIOLA

BY

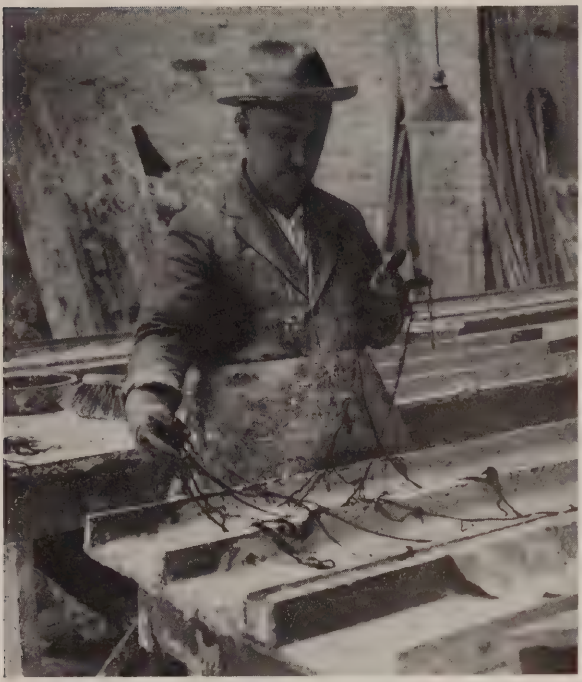
CLIFFORD WAYNE SPENCER

NO art has been subjected to greater abuse at the hands of the modern commercial competitive system than has the making of artificial marble, the result being that many have come to regard it as an altogether unsatisfactory material for building decoration. As a matter of fact, it is difficult to name any form of art work that has been carried to a point more nearly approaching perfection. When the process is carefully performed by a really skilled artist, as it must be to be at all satisfactory, the finished product reproduces the veining, coloring, texture and hardness of natural marble so exactly that the layman is completely deceived, and it is with some difficulty that even the experienced marble expert can detect the difference between real and imitation.

Advantages of its Use. It is not claimed that the imitation is ever superior, or even equal to the genuine product, but there are certain conditions under which the use of artificial marble is of distinct economic advantage and does not impair the appearance or durability of the work. In many instances its use enables the architect to attain the rich effect produced by marble interiors where the cost of genuine marble would have absolutely prohibited its use. Then, too, the use of artificial marble often affords the architect a greater freedom in the designing of interiors. He may desire to attain a definite effect by the use of a certain variety of marble only to find that that particular variety is not available, or that it can be had only after a considerable length of time. He is then faced with the necessity of changing his design to fit the marble supply, or he may have a marble made that will satisfy his desire exactly. This can and has been done, even to the point of "reproducing" a marble that has never existed.

The making and use of artificial marble seem to be subjects on which very little printed information is available. Most people, including some architects, go about surrounded on all sides by artificial marble without ever knowing that such a thing exists. When we enter a great theater or banking room, we may marvel at the size of the vast towering column shafts and perhaps even

A Small Black and Gold Column of Artificial Marble Being Polished in the Shop



RARY

Silk Fiber Being Spread to Give the Veining of Siena Marble

wonder how such great blocks of that particular marble could be found. As a matter of fact, in many instances it is quite probable that such blocks could not be found, since it is a recognized fact that in general, marbles of the more highly colored and elaborately veined types are seldom found in large blocks. Herein, then, lies another of the reasons for the use of artificial marble in preference to that of natural stone,—that is, it is possible to produce monolithic pieces in certain richly colored marbles that would not otherwise be possible even if price were not a factor. Another such reason is that in some cases certain particularly desirable marbles are no longer obtainable and that their reproduction in artificial marble is the only way in which they may be obtained; or it may be that marble work in such unobtainable varieties is to be added to or repaired. In such cases the skilled artificial marble maker can provide a much closer match than can be obtained in any other way. There are many instances of this sort of duplication in daily use where it is almost impossible to detect the point at which the natural marble leaves off and the artificial begins.

High Standards Necessary. Artificial marble work is such that it permits of no compromise between the good and the bad. Either it is an exact reproduction of natural marble or it falls immediately into the class of a cheap imitation of a good building material,—a thing which is such a curse to modern architecture. Therefore, it is necessary that the utmost care be exercised in the choice of the workman who is to do the work, that every feature be carefully specified, and that the specifications be carefully enforced. Intense competition among contractors has led to the introduction of so many bad practices in the process of manufacture that it is quite essential that the architect using this material be familiar with its uses and abuses to a rather unusual degree, if he wishes to assure his client absolute satisfaction.

History. The making of artificial marble was probably first practiced by the Florentine monks in decorating the interiors of churches in about the fifteenth century, and the results of their work may still be found in many beautiful old churches throughout Italy and over all Europe. When we consider that the plaster with which they worked was much inferior to that now available, we realize that they reached a remarkable degree of perfection, due largely to the great amount of time and painstaking care they were able to devote to their work. The exact process they followed is not known today except that it was very similar to the process used in this country up to a few years ago. The plaster was "retarded" or made slow-setting by the addition of a retarding material, usually some sort of glue. The coloring matter was then added, and the whole mixed and kneaded, as bread is kneaded, until the color was spread through the plaster in irregular streaks and veins. After the block thus

Insert and Mosaic Work is Cast in Large Sections

Various Colored Cements are Distributed to Give the Effect of Mottled Backgrounds

formed had been allowed to set partially, thin slices were cut off and applied to the surface to be marbleized. Being still plastic, it was possible to fit and mould the colored plaster to the surface desired. This, however, required a great deal of hand work in order to exactly fit the material together, to make the veining match and the surface even. In drying, these pieces often pulled apart from each other slightly, so that the early examples as they now exist show faint hair cracks between slices of plaster as originally applied. As labor costs rose, the process became less and less profitable, so that now very little, if any, of this kind of artificial marble, which is the true scagliola, is made. Another reason for its disuse is that the plaster does not form as hard a surface as the Keene's cement process does, although there are certain varieties of marble, such as Black and Gold, Verde Antique, and other marbles with dark grounds, whose color and veining can be more nearly reproduced by this process. However, as was said before, the cost in skilled labor is such as to exclude the possibility of its manufacture for commercial purposes. The most approved type of artificial marble as used today is made of Keene's cement. Although this is not properly scagliola, it is often spoken of as such. The manufacture was made possible largely through the introduction and development in England of a special Keene's cement which has never been equaled for the purpose of making artificial marble. The manufacture of this type of marble substitute is still practiced almost exclusively by Italian artisans, there being only about a dozen firms in this country employing a few score of these workmen in the making of the better class of artificial marble.

Artificial Marble is Especially Adaptable to Insert Work

Contracting for Artificial Marble. It seems that the decline of artificial marble making in this country as an art began when the building trades became unionized. The artificial marble workers were taken under the wing of the plasterers' union, and while this in many cases was beneficial to the workers, it also meant that artificial marble contracts were included with plastering contracts and sublet by plaster contractors. This tended to commercialize the business in many instances, whereas the importance of artistry should have kept this part of the work directly under the control of the architect.

Work done under sub-contracts which are peddled to the lowest bidder is usually unsatisfactory, since only labor and material of the highest quality should go into the making of artificial marble, and if the price is forced down by competitive bidding, such labor and material cannot be expected. The present high scale of wages in the building trades increases the temptation for less responsible contractors to skimp on workmanship and material. The more responsible firms have endeavored to maintain the high standards previously established, but unless the architect specifies in detail and insists on his specifications being followed implicitly, he opens the way

RARY

Column Shafts of Artificial Marble are Much Used for Bank Interiors

for firms without established reputation to compete, with their bids based on inferior materials and labor, and the reputable firms, in self-preservation, are forced to do likewise. This forced attempt to save invariably results in a loss to the appearance and finish of the work proportionately far greater than the saving effected. It would be as logical for the painting of the pictures which are to hang on the walls to be included in the general paint contract as it is for the artificial marble to come under the plastering contract. It is strongly recommended that the artificial marble be made on a cash allowance basis or under some arrangement which will give the architect absolute and direct control over the choice of the artisans and the supervision of the work.

The Modern Process. As to the best up-to-date materials and methods for the manufacture of artificial marble, it is perhaps universally admitted that for satisfactory results only the best English Keene's cement should be used for both facing and backing. The English Keene's cement is the only absolutely neutral cement available, and it has other properties which make it more nearly like marble when it has been colored and hardened. Artificial marble is produced by mixing superfine Keene's cement with the proper amount of mineral coloring matter, of proved permanence, to give a ground color to match that of the sample of natural marble which is to be duplicated. Skeins of silk fiber are then soaked in water in which has been ground mineral color to match the desired veining. This color-soaked silk is spread out on a smooth counter (for slab work) in such a way that some strands remain bunched together while others spread out thinly over what is to be the surface of the marble, the effect being remarkably similar to natural marble veining. It is at this point that a great amount of skill and care must be exercised by the workman. The surface coating of superfine Keene's cement is then poured over the threads to a thickness of from 3/16 inch to 1/4 inch. The silk threads which hang together are then carefully drawn out, leaving behind the coloring matter to form the markings of the finished marble. The silk is washed and saved to be used again. Cheesecloth is now spread over the soft cement and dry coarse cement sprinkled upon it. This tends to draw excess moisture from the mixture and gives it a slight initial set. The cheesecloth and dry cement are then removed, and coarse Keene's cement, which is usually pink in color, is mixed with water and poured on the facing cement which is still soft and with which it forms a perfect bond. Burlap reinforcing is usually included in this backing to give it added strength. The backing is poured to the required thickness (usually ¾ or ⅞ inch) and the whole allowed to dry for a few days. It is then rubbed, honed and polished much as is natural marble, except that all work must be done by hand, as the surface is

These Richly Polished Column Shafts are Over 25 Feet High

still somewhat soft and no machine has been found gentle enough to give the proper polish without scoring the surface.

Polishing. Care should always be taken to specify that natural polish be used, as cheap work is sometimes done with a shellac Process known as French polish. This is easy to apply and gives a high luster for a time, but is not at all permanent, and its use should not be permitted in connection with good work. It might seem that if good quality cement is used for the surface layer, the quality of the backing would not be of such great importance. This, however, is not true, since most cements are either highly acid or alkaline in their reaction. When such cement is used, even though it be as backing for neutral cement, the active agents in the cement will come to the surface, destroying the smoothness and partially obliterating the color. The use of cements of different degrees of strength is also likely to result in warping, since the shrinkage of the two will not be the same.

Moulded and Carved Work. Where moulded or carved work is to be executed, the process is similar to that described here except that a clay model is first made and a plaster or glue mould taken from it. The color threads are then spread about in the moulds and the fine and coarse cement poured as for the making of slabs. After the mould has been removed, the surface must be carefully pointed up and made smooth by hand, after which it is allowed to dry several days before being honed and polished. The advantage, from both an economic and a time-saving point of view, of casting a number of pieces in the same mould rather than carving each by hand from the natural stone, will be quite evident. One of the most important uses of artificial marble is as shafts for great monolithic columns, especially in theaters and banks. Obviously, these may not be made in the shop and then set up at the site, as are the smaller pieces, so they are made in place, the process being as for making slabs, except that the color threads are laid and the cement is poured on pieces of oilcloth instead of on the smooth counter. After the cheesecloth and dry cement have been applied, and the surface layer set to the right consistency, the workmen carry the oilcloth with its thin slab of plastic material to the member on which it is to be applied. This has been built up and brought to a surface approximating the finished form with rough Keene's cement, which may in such cases be mixed with 50 per cent of marble dust or fine sand. The slab, oilcloth and all are wrapped about the column or other moulded member and smoothed in place, the overlap being cut away or the gap filled, as the case may be. Great care must be taken that a perfectly smooth joint be made, and that the lines of the veining continue around the whole piece, as in a natural monolithic stone. As soon as possible, the oilcloth is removed and the

The Bank Screen is Real Marble, and the Columns are Artificial

surface made smooth and even. After this, a workman with a graving tool goes over it and "cleans up" the color veins, eliminating ragged edges and smoothing the surface. Great skill is required in this work, since the column must be brought to a true and even surface by hand alone. The entasis of the column must be carefully worked up and the whole thing brought as nearly as possible to a state of perfection. It is true that this perfection is not attained to such a degree as is the case with monolithic columns in natural stone, which can be turned on lathes and honed and polished in the same manner, everything being done with mechanical precision, but the slight irregularities and imperfections resulting from being finished by hand are not necessarily a disadvantage from an artistic point of view.

Lasting Qualities. As to the permanence of artificial marble, much can be said. The monasteries and churches of Italy, of course, were decorated with a different class or variety of artificial marble, the plaster process being much inferior to that in use today. Notwithstanding this fact, much of the work done then is still in a good state of preservation after over 500 years of service. In St. Peter's there are scagliola columns which are still in perfect condition and whose composition is never suspected by the thousands who visit the structure annually. The present Keene's cement process has been in use for only some 50 years, there being examples of work of about that age still in existence. Much of the older work in this material has been destroyed when buildings, of which they were a part, were demolished. Such buildings as the Waldorf-Astoria and the Bellevue-Stratford hotels contain much artificial marble, and the Brooklyn Trust Company's building contains some very fine artificial marble still in good condition after a period of about 18 or 20 years. It is said that artificial marble continues to grow harder with age, attaining a flint-like hardness after the passage of several years. In the shop of H. A. Cousins (now retired), who is considered the dean of the artificial marble industry and to whom is due much of the credit for its development in this country, a slab of artificial marble about 6 feet by 9 feet, said to be one of the largest slabs ever made in this material, was left standing for several decades. It was finally decided to divide it into smaller pieces for use, but it was found that it had attained such hardness as to make cutting impracticable.

Limitations. It should be clearly understood that artificial marble should never be used for exterior work, and that even in interiors it should not be brought too near the floor where it will be subject to moisture from mopping or other sources. It is quite common practice to have a base of natural stone surrounded by wainscot and trim of artificial marble, the marble thus being protected from injurious direct contact with water.

Cost. Although, as has been explained, there are some cases in which artificial marble fills a

Artificial Marble is Combined with Genuine in Many Elaborate Theater Interiors need that cannot be supplied by natural stone, its chief *raison d'etre* lies in the economic advantages that may result from its use. These are probably becoming less and less as the highly skilled labor necessary for every step of its manufacture becomes scarcer and more costly. Natural marble can be worked largely by machinery, so that the proportion of its cost chargeable to labor is much less than is the case with artificial marble, when no machine work at all is possible. This high cost of labor has led in many cases to the cheapening of artificial marble by its manufacturers to meet the competition not only of one another but of the marble industry as well. For the purposes of this discussion, however, only such material as conforms to the highest standards, and which will compare favorably with the marble it reproduces, will be considered. It is not true that artificial marble is cheaper in all cases than its corresponding variety of genuine marble. Several factors govern the scale of comparisons between the two materials, one of which is the fact that all marbles can be reproduced in artificial marble at practically the same cost. The ordinary low-priced domestic marbles and some cheaper Italian varieties may be quarried and finished at a cost well below that of the same variety in artificial marble. As the value of the genuine marble increases, according to its coloring and beauty, while that of the corresponding reproductions remains about constant, a point is reached where the cost of natural marble becomes greater than that of artificial marble, making the substitution of the latter more and more desirable. Another factor affecting comparative costs is the degree to which the piece is to be moulded or carved. It is obvious that to produce a moulded object in clay and make a casting of it is vastly easier than carving the same object from a block of stone. Then, too, if the same mould can be used to cast several or a large number of pieces, the economic advantage of using artificial marble is increased almost in proportion to the number of the pieces. The type of work which affords the greatest saving and which is most often done in artificial marble is, of course, the making of large monolithic columns. Even if natural blocks of sufficient size could be obtained, the great difficulty in quarrying, manufacturing and transporting them would make their cost so great as in some instances to exclude the use of marble altogether. In such cases, if the column shafts can be made in artificial marble in connection with other parts of natural marble, a great saving may be effected without detracting from the beauty or stability of the work. Artificial marble is particularly adapted to use for insert work where a design is made up of a large number of pieces of contrasting marble. In such work, the various parts may be cast in a single block and thus bring about a worth-while saving in the cost of setting, at the same time insuring better joining of the pieces and a more lasting bond between them. In general, then, it may be

Ashlar and Artificial Marble Panels as a Background for Real Marble Pilasters

Artificial Marble Columns in the State Capitol of Idaho

said that it is advisable to use artificial marble only to duplicate: (1) very expensive marbles, or those difficult to obtain; and (2) for marble work that contains carved or moulded detail, especially if there be a large number of repeats.

The Architect's Responsibility. It seems that a great deal of the responsibility for the maintenance of the high standards in the artificial marble industry rests squarely on the broad shoulders of the architect. By specifying clearly and explicitly and supervising carefully artificial marble work under his control, he may force the artificial marble industry to do work such as will command the respect and admiration of all, or he may allow it to fall into such disrepute as to finally disappear altogether. Certain it is that for his own protection he should not allow work, which can produce such a terrible effect when poorly done, to be performed without taking precautions to insure the high quality of the result.

Details and Specifications. In general, work to be executed in artificial marble may be detailed exactly as for other stone or marble work. However, a draftsman who is equipped with a thorough understanding of how artificial marble is made, as well as of its limitations and advantages, is often able to detail the work in such a way as to take full advantage of the plastic qualities of the material and thus save considerably on the cost. A summary of some of the more important points and axioms governing the making of artificial marble may be found in a standard specification adopted by the National Building Congress, to be used by architects in the specifying of high class work. Among other things, these practices should always be insisted upon by the architect: (1) Use only the highest grade of English Keene's cement for both facing and backing, together with mineral colors of proved permanence. (2) Contracts should be entrusted only to workmen or firms of established artistic ability and prestige, and who can give satisfactory references as to work successfully completed. (3) After casting, the face should be dried up twice to insure hardness. (4) All work should be stoned twice and afterwards finished with a natural polish without the use of shellac or other surface applications. (5) The superfine surface coat should be not less than 3/16 inch thick, and should be applied to grounds or backing prepared the same day, to insure perfect cohesion. (6) There should be no visible joints where sections are joined, and veinings should continue around columns as on a monolith. (7) The surface should be brought to a perfectly even and fine line before honing and polishing. (8) The architect should reserve the right of rejecting all work not satisfactory up to one month from the date of completion, and it is not asking too much to demand that the contractor guarantee the work against defects of workmanship and finish for a period of at least two years.

LIBRARY

In Installations Such as This the Presence of Artificial Marble is Never Suspected

It is Almost Impossible to Detect the Division Line Between Real and Artificial Marble

ELECTRICAL WIRING LAYOUTS FOR OFFICE BUILDINGS

PART II

BY

NELSON C. ROSS

ELECTRICAL ENGINEER, RICHARD D. KIMBALL CO.

MOTORS operating toilet vent fans, hood vents, and other motors at the roof may be under remote control with controlling push-button stations and pilot lamps in the superintendent's office, the boiler room, or elsewhere as desired. Separate circuits may be run from the distributing switchboard for the operation of each of the elevator machines, or two feeder circuits may be used, each of the required capacity for the combined load, these cables terminating in a transfer panel made up with double-throw switches and located at a central point in the elevator machine room. Tap circuits are taken from the panel to each of the elevator controllers, thus permitting the full operation of the elevators from one circuit in the event of breakdown of the other.

Motor service may be required for any or all of these services:

Ventilation

Fresh Air Fans.
Main Vent Fans.
Air Washer Pumps.
Ventilating Units.
Kitchen Hood Vents.
Cafeteria Vent Fans.
Vent Fans for Assembly Hall.
Toilet Vent Fans.
Vent Fans in Booths.

Boiler Room Section

Vacuum Pump Equipment.
Boiler Feed Pumps.
Motor and Ash Hoists.
Water Circulating Pumps.
Coal Handling Equipment.
Draft Fans.
Stoker Motors.
Fire and Tank Pumps.
Boiler-room Sump Pumps.
Monorail Hoist.
Oil Burners.
Oil Pumping Equipment.

General Power

Passenger Elevators.
Freight Elevators.
Refrigeration of Air.
Kitchen Refrigeration.
Brine Circulation Pumps.
Vacuum Cleaner Plant.
Air Compressors.
Repair Shop Motors.
Circulating Pumps for Drinking Water.

Kitchen Section

Dish Washer.
Vegetable Peeler.
Food Chopper.
Buffers and Polishers.
Knife Grinders.
Ice Cream Machines.
Ice Crushers and Cubers.
Individual Refrigerators.
Cake Mixers.
Cake Beaters.
Electric Ovens, Ranges and Warming Closets, etc.

Available Service. In general, the lighting service will be delivered to the building over direct current or single-phase alternating current lines and at the standard lamp voltage of 110-115 volts. Lamp bulbs, small heating, and office equipment, if of the proper voltage, will operate equally well on either direct or alternating current. Depending on the location of the building and the development of the public service company's lines, motor service may be delivered over:

(1) Direct current, three-wire system at 115-230 volts, power being taken from the outside wires at 230 volts.

(2) Single-phase alternating current, three-wire system at 115-230 volts, power taken at 230 volts.

(3) Three-phase alternating current at 220-440 or 550 volts.

(4) Two-phase alternating current at 220-440, or 550 volts, four-wire service.

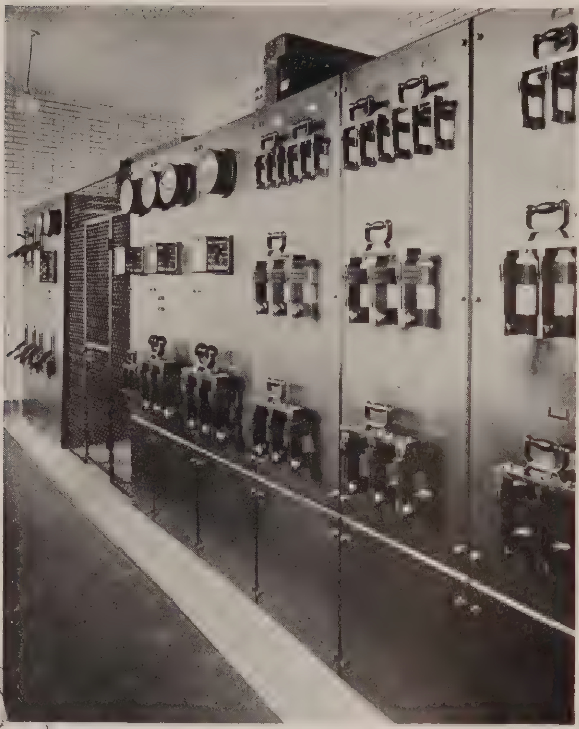
(5) Two-phase alternating current at 220, 440, or 550 volts, three-wire service.

The standard frequency is 60 cycles. In certain locations, however, the service may be delivered at 25 or 40 cycles. Lamps, heating and office equipment, etc., will operate satisfactorily on these frequencies. Motors and motor circuits, however, must be designed to operate on the available motor service, and if alternating current, the motors must be wound for operation on the phase, voltage, and frequency of the service lines. If the service is to be supplied from a private generating plant on the premises, the character of the motor service may be selected. Even with the use of a private plant, it is good practice to select generating equipment corresponding to the phase, voltage, and frequency, as that used by the public service company, thus permitting of an auxiliary throw-over service with the company's lines, or the future purchase of the service.

Service Connections. It is advisable to provide an electrical switchboard room (even in smaller buildings) in which the service switchboard and master metering equipment may be installed, the riser and feeder cables passing from the service switchboard to, and connecting with the distributing switchboards, panels, wire closets, and other equipment. The switchboard room should be accessible from a public room or corridor, or from the outside of the building.

In certain cities local ordinances require an outside entrance to the switchboard room, giving the fire department access to the service switches. If this is impracticable, the control of the service switches must be within reach of a window, or it may be located under glass in the main vestibule or corridor, the service cables passing through the switches and terminating in the buss connections of the switchboard.

For smaller buildings the service switchboard room may approximate 8 by 10 feet in floor dimensions, with full head room. For larger buildings, a service switchboard room is necessary, and if the service switchboard is to be combined with the main distributing switchboard, a floor area of 25 by 40 feet or more may be required. The



Typical Service Switchboard for Large Building Showing Power and Lighting Sections

room height should be ample to permit the installation of large horizontal feeder conduits from the distributing switchboard to the wire shafts and equipment.

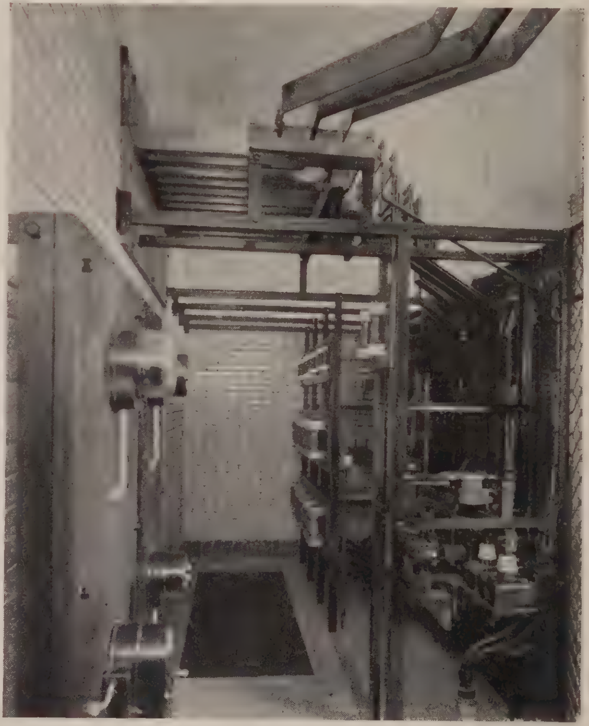
Service and Distributing Switchboards. For smaller buildings, the service switchboard may be developed with the use of fused safety switches mounted on a wood backing and interconnected with conduit and wires, or may be made up with fused switches in a steel cabinet, or it may be of the floor-standing type as desired. For larger buildings, the floor-standing type will be a necessity, made up with slate panels and the required number of fused knife switches, and circuit breakers, instruments, etc., for the control of the feeder circuits and mains. The board, as a rule, stands approximately 6 feet from the wall with buss connections and fuses mounted at the rear of the panels, and with separate panels for control of the power and lighting feeders.

The "service metering equipment" may be mounted on separate panels as a part of the switchboard, or it may be on a separate switchboard in the service room. The switchboard room should be located at the point of service permitting the service cables to enter the room directly from the street, or from the transformer vault. If a vault is to be used, the switchboard room should be a part of the vault, and it should be separated from it by a fireproof partition.

For larger buildings a distributing switchboard must be considered, this located in a separate room on the basement or sub-basement floor, and at a point central for the load, the switchboard being made up in two sections mastering the power and lighting services respectively, and equipped with fused switches or circuit breakers connected to control each of the sub-feeder circuits or risers leading from this switchboard to the meter closets, panel boards, and motor-driven equipment. Where the voltage of the motor circuits exceeds 230 volts, sub-feeders should be mastered from oil circuit breakers on the power section of the switchboard. Sub-feeder conduits leading to the distributing switchboard may terminate in a steel junction or pull box over the switchboard, the wires of the sub-feeders passing through bushed holes in the bottom of the box and connecting with the circuit breakers and switches.

Transformer Vaults. If the available electric service is to be "direct current," the cables will enter the service room directly from the street, and terminate in the master service switches, one or more cables being installed as may be required for capacity, or to provide for emergency service. With the use of alternating current, the company may provide transformers in pits on the street, or on poles (if the service is "overhead"), or the company may require a private vault on the premises, or incorporated in the building. For other than small buildings a private vault is preferred.

The vault must be of fireproof construction,

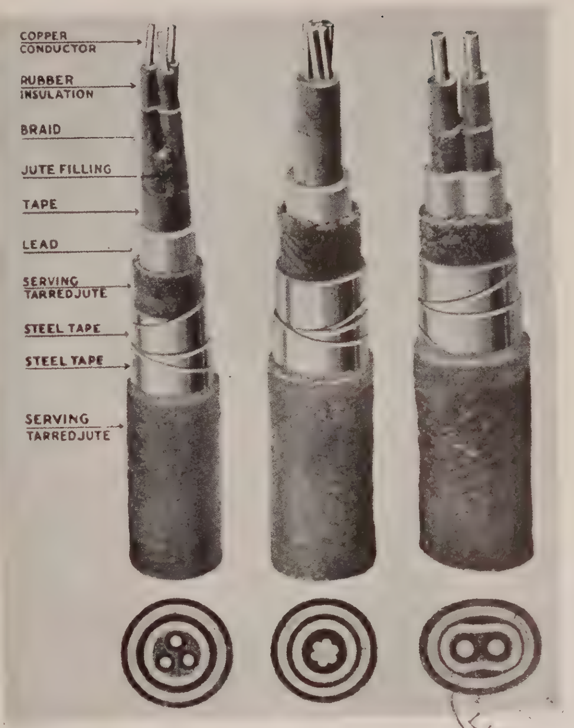


Rear of Same Switchboard, Showing Buss Connections to Transformer Vault with cement floor and ceiling and with walls of cement or of brick; it must be vented to the outside of the building, equipped with a floor drain, underwriter's door with lock, and with a 6-inch cement curb at the door to prevent the escape of oil in the event of there being defective transformers. Where possible, the entering door should be from the outside of the building. If this is impracticable, then from a public service corridor or from the boiler room, as approved. Where possible, with the use of an inside vault, the outer wall of the building should form one wall of the vault and be so arranged that the primary cables may enter the vault directly from the street. Where it becomes impracticable to locate the vault at the outside wall, the conduits and primary cables must be carried from a point outside the building under the floor to the vault, or the primary conduits must be surrounded with 12 inches of masonry to the approval of the company.

The required floor area will depend upon the number and capacity of the transformers required, approximating 8 x 10 feet with 7-foot head room for installations, not exceeding 100 K.V.A. with proportionately greater floor area as the capacity of the transformers is increased. The size and arrangement of the vault must have the approval of the company for each installation. Regardless of the location of the vault, provision must be made so that the transformers may be readily removed and replaced.

Service Cables. The type and construction of the service cables, as well as the method of bringing these cables into the building must, in each instance, be to the approval of the service company. The service cables must extend from the company's lines on the street or public right of way to the transformer vault, or to the master service switches. In the event of the service being "overhead," the company will extend the lines to some determined point near the building, and from the service pole the cables may enter under ground to the vault or the service switches.

With underground service the company will bring the lines to a service pit on the street, from which point the service cables will enter the building as just explained. As a rule, the company will bring the service to the property line at its own expense. All service cables on the property will be at the expense of the building's owner. A splicing pit will be required at the curb, with either overhead or underground service. Where underground service cables pass under cement walks or roads (between the service pit and the building), underground conduits must be used, made either of tile, galvanized iron or of wood fiber, these being laid in trenches, in straight lines and to grade. Splicing pits will be required in the lines at intervals of not exceeding 200 feet and at offsets or where the line changes its direction.



Cross Sections and Partially Stripped Sections Showing Construction of Parkway Cable

Where, as in outlying districts, the service cables may be under lawns and shrubbery, and at right angles under walks or roads, Parkway cables may be used, these laid in single lengths without pits, between the building and the service pit at the curb. The Parkway cables are sheathed with lead over the insulation, are protected with steel tapes, and saturated jute servings, and are laid in trenches without further protection. Where Parkway cables pass under roads or walks, pipe sleeves may be used, and the cable passed through them, permitting the removal of the cable in the event of breakdown without disturbing the road. This also applies to Parkway service cables where they pass under the floor of a building to an interior service room, as pipe sleeves must be provided to permit the cable to be removed in the event of accident without the necessity of opening the floor.

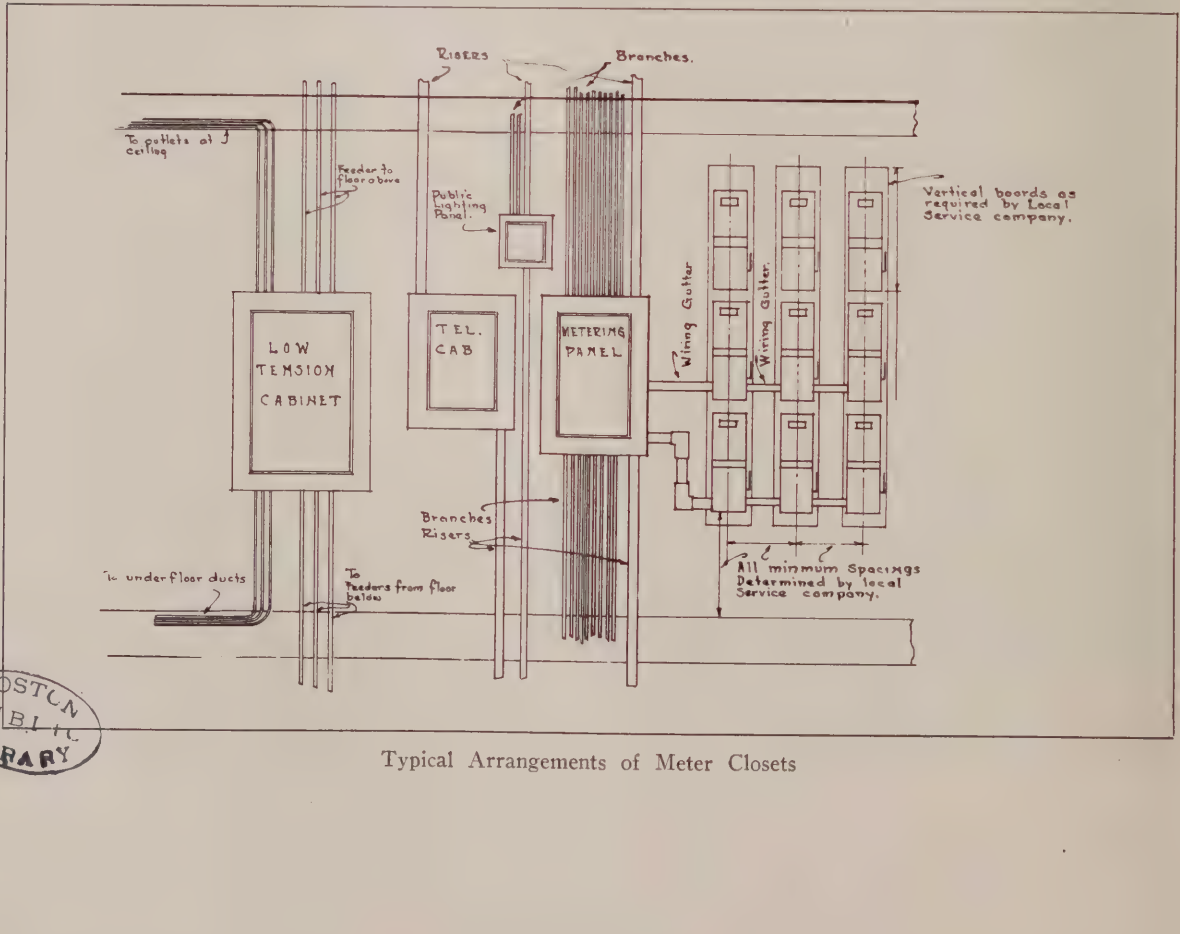
Provision for Low Tension Equipment. Complete low-tension equipment may include public and private telephones, electric clocks, bells, paging equipment, office signal and annunciator systems including time clocks and time stamps, etc., as well as fire alarm and watchmen's clocks, and provision for A.D.T. and Western Union service wiring. With smaller office buildings, low-tension wiring may include only provision for public telephones, watchmen's clocks and possibly provision for A.D.T. or Western Union service. With larger buildings, particularly when occupied largely by one tenant, all of these may be called for. In general, the outlets for fire alarm and watchmen's clock stations, bells and electric clocks, etc., may be permanently located, as these outlets may occur in public corridors, on columns, or on permanent walls. Outlets for office equipment, however, may not be permanently located, as there are no fixed locations for desks, and the furniture layout will be changed by tenants.

Public Telephones. In general, provision for public telephones must include a raceway of empty conduits, terminal cabinets, and junction boxes, in readiness for the installation of terminal strips and telephone wires. The conduit raceway must be installed to the approval of the telephone company by the building owner, all required telephone wires, terminal strips, and instruments, etc. furnished and installed by the telephone company.

Where meter closets are to be used, terminal strips and cabinets will be located in the meter closets, on the respective floors. Where, in smaller buildings, meter closets may be omitted, the terminal cabinets and terminal strips may be mounted on the wall of some public corridor, on one or more floors. The size and wire capacity of the terminal cabinets will depend upon the maximum number of instruments to be served. Sizes may be obtained from the company upon request. The telephone service conduit will enter the building at the point determined by the company, usually terminating in a steel service cabinet in some service corridor or in a room accessible from a public corridor, and near the point of entrance.

The dimensions of the service cabinet may approximate 6 x 10 feet by 12 to 18 inches in depth, depending upon the service. The cabinet must be equipped with wood back and fitted with steel doors under lock. A separate compartment may be provided in the service cabinet for the wires of the A.D.T. and Western Union services. In very large systems a service room is to be preferred. From the service cabinet, riser conduits must be carried to the terminal cabinets in the meter closets or in the corridors, and the cabinets looped vertically on the conduits. Riser conduits must be proportioned for the sizes of cables. These conduits are seldom smaller than 2-inch, are run without bends, and connect to alternate sides to provide spare riser conduits, permitting the installation of cables without sharp bends. Where bends or offsets occur in the risers, junction or pull boxes should be used to the approval of the company. Expense permitting, it is good practice to provide spare riser conduits, permitting the later extension of the system.

All this construction will, in general, apply to all types of office buildings with a few exceptions. With larger buildings, meter closets of ample sizes should always be considered, as large terminal cabinets on the corridor walls will prove unsatisfactory. Where, due to the floor area, two or more meter closets may be used on a floor, separate conduit risers should be run from the services to each of the meter closets on the lower floors and loop vertically through the terminal cabinets in the



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Typical Arrangements of Meter Closets

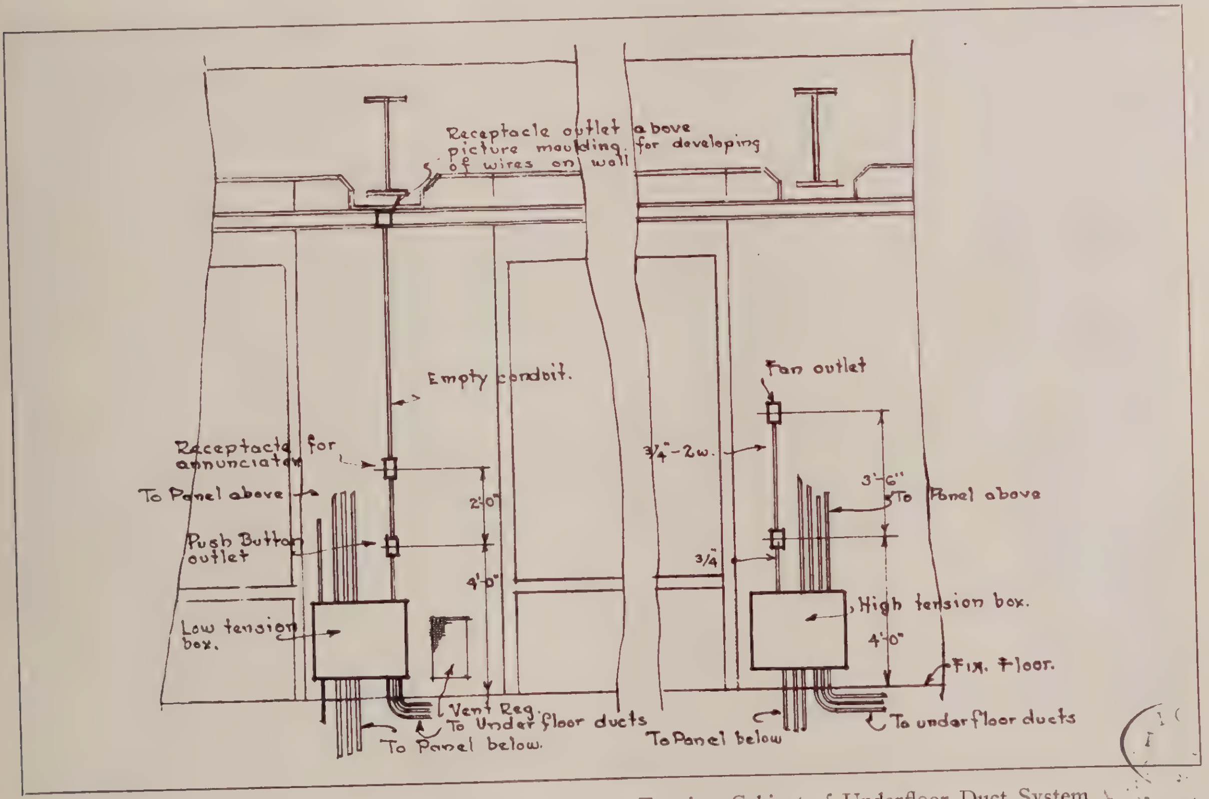
meter closets on the upper floors of the buildings.

Where, as with a large office building, occupied largely by one tenant, a private branch telephone exchange may be required, the exchange and wire service room should be as near the center of the building as is possible. With this construction, the service cables are carried into the building through a service junction at the point of entrance, passing from the junction direct to the service room at the exchange, and developing in conduits from the exchange to the distributing terminal cabinets in the meter closets. With this construction, the wires of the A.D.T. and Western Union services are taken from the telephone service cable at the time-service junction, and pass through a separate conduit raceway to the low-tension cabinets in the meter closets. Adequate junction or pull boxes must be used in all service telephone conduits, at all bends, and in all lines exceeding 150 feet between cabinets or terminals.

Branch Telephone Circuits. One method of outlet wiring for office telephones provides fixed conduit outlets in the permanent walls and on columns, setting the boxes at points above picture mouldings, and also at the baseboard, connecting these outlets with conduits and running conduit from the feeding outlet to the terminal cabinets in the meter closets or in the corridors. In making connections to the office instruments, the wires pass through a bushed hole in the cover of the outlet box and are run exposed on the baseboard or behind picture mouldings to the instruments. While flexible, this method is more or less bulky, and it requires a large number of outlet boxes, as well as large conduits for development of circuits.

A more simple arrangement employs the use of a deep picture moulding set at approximately 4 inches below the ceiling on all walls throughout the corridors and offices, public space, etc., and the further use of 2-inch fiber tubes through all walls and partitions, these tubes set flush with the face of the walls, and aligning with the wire space of the moulding. From the terminal cabinets 1½-inch conduits pass in the construction to junction boxes set flush with the walls and at the rear of the wire mouldings, separate conduits being used from the terminal cabinets to the mouldings on each side of the corridor. The telephone wires pass from the terminals, through the conduits to the mouldings, and are concealed in the wire spaces in the mouldings, passing from room to room through the bushings or tubes. The mouldings are drilled where required, and the wires are run exposed to the instruments.

Further flexibility is secured by the use of vertical 1½-inch conduits at intervals of 50 feet in the corridors, these looping through junction boxes at the rear of the mouldings, permitting the ready installation of low-tension wires between the offices on the different floors. This equipment

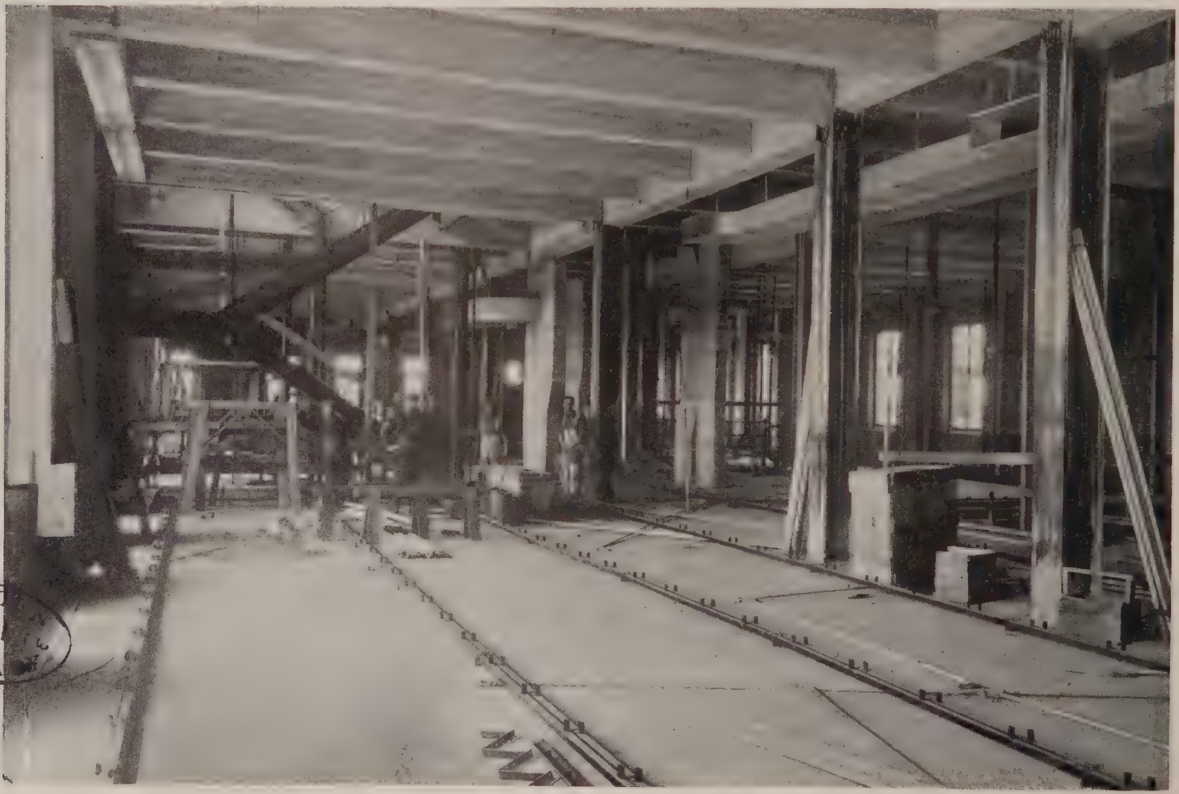


Arrangement of Outlets at Each High and Low Tension Cabinet of Underfloor Duct System is inexpensive to install; the wire capacity is limited only by the sizes of the conduits and the wire space provided in the mouldings.

Underfloor Raceways. These methods of telephone and low-tension wiring work out well in limited areas, as desks may be set reasonably near the windows and columns. Instruments may be used on the desks, with ringers and like equipment mounted on the walls. Wires, however, where run exposed may be objectionable, even though installed in metal mouldings. Larger office areas with desks and other furniture not in proximity to the walls and columns, will require service from the floor. The use of standard floor boxes and conduit wiring does not always prove satisfactory for this service, due to the sizes of conduits required for the development of the underfloor wiring, and the necessity for three separate conduit services for all floor outlets.

In general, the most flexible underfloor wiring may be had with the use of underfloor steel raceways consisting of a network of rectangular steel ducts, junction and crossover boxes and steel tube inserts, etc., the whole being embedded in the floor slab so that the tube inserts and covers of the junction boxes are flush with the finished floor. The system may be designed to cover the whole floor area, or such portions of the floor as may be required for special work, and ducts may be laid parallel with the walls and for full coverage may be spaced from 4 feet, 6 inches to 6 feet apart, depending upon the locations of the columns and the space available for desks, etc. Junctions or crossovers should be spaced not more than from 25 feet to 40 feet in the duct lines and home run ducts of feeder conduits taken from the nearest junctions to the meter closets, and connecting with the cabinets and panelboards. The system may be designed with the use of one, two, or three ducts, depending on the coverage and flexibility desired. Separate ducts, however, will be required for the wires of the lighting, telephone, and details of miscellaneous low-tension office equipment.

For maximum flexibility and full coverage, the "three-duct system" should be considered, consisting of two 3⅛x1¼-inch ducts and one 1¼x1⅞-inch rectangular steel duct, providing three separate steel underfloor raceways for the wires of the lighting, telephone, and miscellaneous low-tension systems. The junction boxes may also be so arranged that pipe conduit runouts may be taken from the junction boxes to feed special outlets on the walls and columns (where a single service may be required) or to cross connect the duct system with subordinate panel cabinets or connecting boxes. The three-duct systems are fed and extended through single three-duct junctions and crossovers, partitioned so that there is no in-



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Two-Duct Metal Raceway Being Installed

tercommunication between the three systems, the crossovers and junctions, ducts, etc., requiring not more than a 4-inch slab for installation.

By the use of auxiliary panel cabinets at intervals in the walls of the different floors, connected with vertical conduits, and the connection of the cabinets with conduits to the duct system on each of the floors, the system, combined with the meter closets, becomes an underfloor conduit raceway throughout the entire building, permitting any reasonable combinations of wiring between desks on one or more floors without the necessity of cutting floors for the installation of conduits.

Tube inserts are built into the ducts in the process of manufacture, and no drilling is required for the installation of equipment. Special receptacle heads are provided (these fitting with expanding couplings in the tube insert) for desk lights, telephones, and low-tension office equipment. With the installation of wires, it is but necessary to remove the covers of the required crossover boxes, as well as the caps of the insert tubes at the desks, the wires being readily fished and final connections made at the respective cabinets in the meter closets.

Where partial coverage only is required, and it is not desired to develop the three-duct system of underflooring wiring, a two-duct or single-duct system may be used with the usual junctions and crossovers, and may be connected with meter closets or with standard panel boards of the lighting service.

Electric Time Systems. The development of an electric clock or time system synchronized from some central point of control is almost a necessity in modern office buildings, since it provides for accurate and uniform time at all outlets of the systems and permits of the development of office clocks, time stamps, employes' time clocks and like time equipment. With outlets for synchronized time available in all offices, and throughout undeveloped office space, clocks and like equipment may be connected to the system or removed at will, and the time system readily developed to meet all requirements of tenants. The time service may be included in the office rental, or clocks may be installed at the request of the tenant at a fixed annual charge. The time system may be designed to operate on alternating current circuit from the lighting service, or for direct current and operated from a central storage battery. The wiring with either system will be substantially the same.

While round metal case secondary clocks with either 8-, 10- or 12-inch dials are in general use for office work, secondary clocks of any design and finish are available, and also in either the floor, desk, or semi-flush wall type. Secondary clocks in general should be considered for offices, corridors, elevator lobbies, special offices and rooms, and in assembly halls, gymnasiums and cafeterias. If large outside bracket clocks, pedestal, or tower clocks are to be considered, these may also be readily operated from the time system and under synchronized control from the master clock. Where tower clocks are to be illuminated, the illumination may be under automatic control of the time system. The master clock and program movement may be in some public office, usually that of the building superintendent; the storage battery for the operation of the time system may be in a room convenient to the clock or in the switchboard room of the lighting service.

Master Clock. The master clock controlling a large installation will, in general, be of the floor type, with three compartments containing the clock, the program movement, and the transfer board equipment respectively, the whole designed to conform to the surrounding finish. For large installations, the clock may be equipped with ten or more circuits with the corresponding number of circuits for the program movement, and the plugging or transfer board will require floor space of approximately 2 x 10 feet.

Wiring. All circuits of the time system should be run with rubber-covered wires in conduits, branch circuits being of No. 14 gauge, branch circuits on each of the respective floors running back to and connecting with the terminal strips of the low-tension cabinets in the meter closets. Branch circuits should loop through the clock outlets with not more than ten outlets connecting to the circuit. Circuits to desk outlets will develop from the low-tension cabinets through the duct system to the desks. Riser circuits from the master clocks pass to the meter closets on the lower floor, looping vertically through the meter closets on the upper floors, connecting through the low-tension cabinets to all circuits of the time system.

Separate circuits are, as a rule, carried from the master clock for the control of outside bracket or pedestal clocks and also for tower movements. Six No. 10 or even larger wires may be required for the control of the tower movement and illumination. Service wires from the battery to the master clock will depend upon the load and the distance from the battery to the clock. In general (for large installations) these wires are not smaller than No. 4 gauge. A separate circuit of two No. 12 wires must run from the master clock to the battery for the automatic operation of the battery charger. General battery current may be provided at each of the low-tension cabinets in the meter closets by means of riser circuits from the battery (not less than two No. 4 wires), the battery circuits looping through each of the low-tension cabinets, and providing battery current for miscellaneous low-tension office equipment.

Where, due to the type of the building, and the location of the master clock, the clock and bell circuits exceed some 300 feet in length, the relays may be located in the meter closets at some central point rather than in the master clock, the primary circuits from the master clock operating the relays which take current from the battery wires for control clocks and low-tension equipment.

Corridor Gongs. With the use of a building largely occupied by one tenant, corridor gongs may become a necessity, as these gongs, operating on a schedule from the master clock, direct the employes where group control is desired. The gongs should be located at central points, wired in multiple, using No. 14 wire in conduits feeding back to the low-tension cabinets in the meter closets and from the program clock. Where a common schedule is used, with all bells ringing upon the operation of the relays, the gongs may be connected in multiple on a two-wire circuit. When, however, it is desired to change the schedule of any individual bell or group of bells at will, a plugging or transfer board must be used at the clock, and the gongs are connected to a common wire with a separate wire from the plugging board to each and every gong.

Storage Batteries. The capacity of the required storage batteries will necessarily be determined by the size of the time system and the equipment to be operated therefrom. As a rule, the battery required for a large installation will be of not less than 300-ampere hour capacity, at 24 volts. A duplicate battery should be considered, as well as duplicate charging equipment from the master clock. The battery should be furnished with controlling switchboard fitted with the usual equipment, including instruments, circuit breakers, and fused switches for control of time and low-tension systems.

Interior Telephones. The wiring for interior telephones and office signaling equipment, etc., cannot well be included in the wiring layout of the building, without exact information as to the location of desks and the scope of the equipment desired. With the use of under-floor raceways and telephone corridor and office mouldings, these in turn connected with the low-tension cabinets in the meter closets and on the walls, the wires of the local systems may be readily installed and connected as desired.

Watchman's Clocks and Fire Alarm. The combined watchman's clock and fire alarm system (A.D.T. or like service) will include an empty conduit raceway, (usually ¾-inch conduit) with connection to the gongs, station boxes, the control station and the point of service. The gongs and station boxes will be set in the stair halls, corridors, boiler rooms, large storage areas, basements and elsewhere as may be required to insure the complete coverage of the building by the watchman in his rounds. The exact location of the boxes will be at the approval of the company. The company will furnish the box grounds or casings and deliver them to the building ready for installation in the rough by the electrical contractor. The boxes are set one over the other on the different floors and are connected in series on the conduit risers, with cross connections run in the sub-basement space.

The gongs and stations as well as all cable and equipment will be installed by the company at the completion of the work. It is good practice to provide a lamp receptacle on the wall and at a point over each fire alarm station. These receptacles are fitted with red lights of small wattage, the lamp being kept burning to indicate the character and location of the station. With the use of a private watchman's clock system the locations will be the same, with the clock in the office of the building superintendent. Stations may be of the magneto type and set flush with the walls, connecting with the common wire and an individual wire from each of the stations to the clock. Wires should not be of less than No. 16 gauge rubber-covered wire. The use of the private fire alarm system will necessitate the same conduit raceway as noted here for the combined system, with the master station located in the superintendent's office, the boiler room or some convenient point, and with battery service furnished from the storage batteries of the clock system.

Paging System. These systems in general may consist of a series of single-stroke gongs or sounders located throughout the corridors and elsewhere as required, these sounders being connected on multiple circuits (with No. 14 rubber-covered wire in conduits) the circuits carried back to the meter closets on each floor. From the nearest meter closet the master circuit is carried to the exchange telephone switchboard and connected to the control from a master call station which sounds the required call signal on all of the sounders until the individual called communicates with the exchange switchboard. The system may cover the whole or any part of a building as desired, and may be operated from the exchange switchboard or from push-buttons in the superintendent's office or from some central point as desired. The system may operate from the lighting current at 110 volts or from the low-tension system at 24 volts. With the use of push-buttons at the entering doors, the button circuit may be extended to the master call station at the exchange switchboard, thus sounding the paging gongs or sounders from the door when the building is locked, and notifying the watchman that he is wanted at the door.

THE ARRANGEMENT OF SPECIFICATIONS

BY

ERNEST O. BROSTROM

FIRST, there came the standardization of general document sizes. 'Twas a boon to get away from the mixed papers, letters of any old dimensions, contracts of legal cap size, and end-rolling specifications that reminded one of ancient papyrus scrolls. And catalogs! Scramble every letter and punctuation mark, and they could not adequately represent the confusion of the architect's file of—say—a decade ago. Then came the American Institute of Architects with the "standard filing system for information on building materials and appliances." It has been tried and—lives. The creators of sales publications have not found it excessively difficult to produce folders and catalogs of uniform dimensions, nor to arrange them so that they can be easily placed in the proper divisions of the file, and, in turn, be readily resurrected when wanted.

Thus there has been a steady advance toward order in this part of the architect's business. For himself he demands that others shall present their information in a thoroughly ordered manner. Fine, but is he giving out as he is receiving? Assuredly some offices are producing work thorough and complete in every detail. This is almost universally true of the drawings. The specifications, too, are subdivided in close approximation to building progress. But the arrangement of the divisions themselves within the specifications? Can you go to your brother architect and turn to a particular item of the work and find it in the subdivision of his specification in which you carry this item in your own? No. Neither can the contractor!

It is a very simple matter to re-arrange a specification sequence so that the various sections tally perfectly with the numerical numbering of the A. I. A. standard catalog classification. The page numbering of the sections and many of the paragraphs may quite readily bear the file number corresponding to that of the A. I. A. classification. Then a salesman will know exactly where to find the specification bearing upon his interests. His sales book and your file and the specification carry the item or items in the same order. The contractor will know just where to turn in a specification for any particular portion. Jones & Jones' specifications and yours, and Debilicale's, all following the same general arrangement, will facilitate estimating. The general order of the estimator's take off will become the same as the specification order,—not only for one office, but for all offices, and that as widely as this orderly practice may extend itself. The standard classification sequence will become an index that is already very natural and will easily be remembered.

To illustrate. The general conditions may be ordered much like the A. I. A. standard documents and bear a prefix letter or letters.

Section 1.—Preparation of Site. There are always items that come under this heading.

Section 2.—Excavation. Occasionally there comes a job when there is no earth work; then this section naturally does not enter into the specification and is omitted.

Section 3.—Masonry Materials. In the usual specifications the materials for the various masonry contracts are carried under each respective head, but there seems no adequate reason why this classification should not stand.

Section 4.—Concrete. And so it goes on down the entire numerical order.

Paragraphs, too, may bear an exact identifying number, for instance:

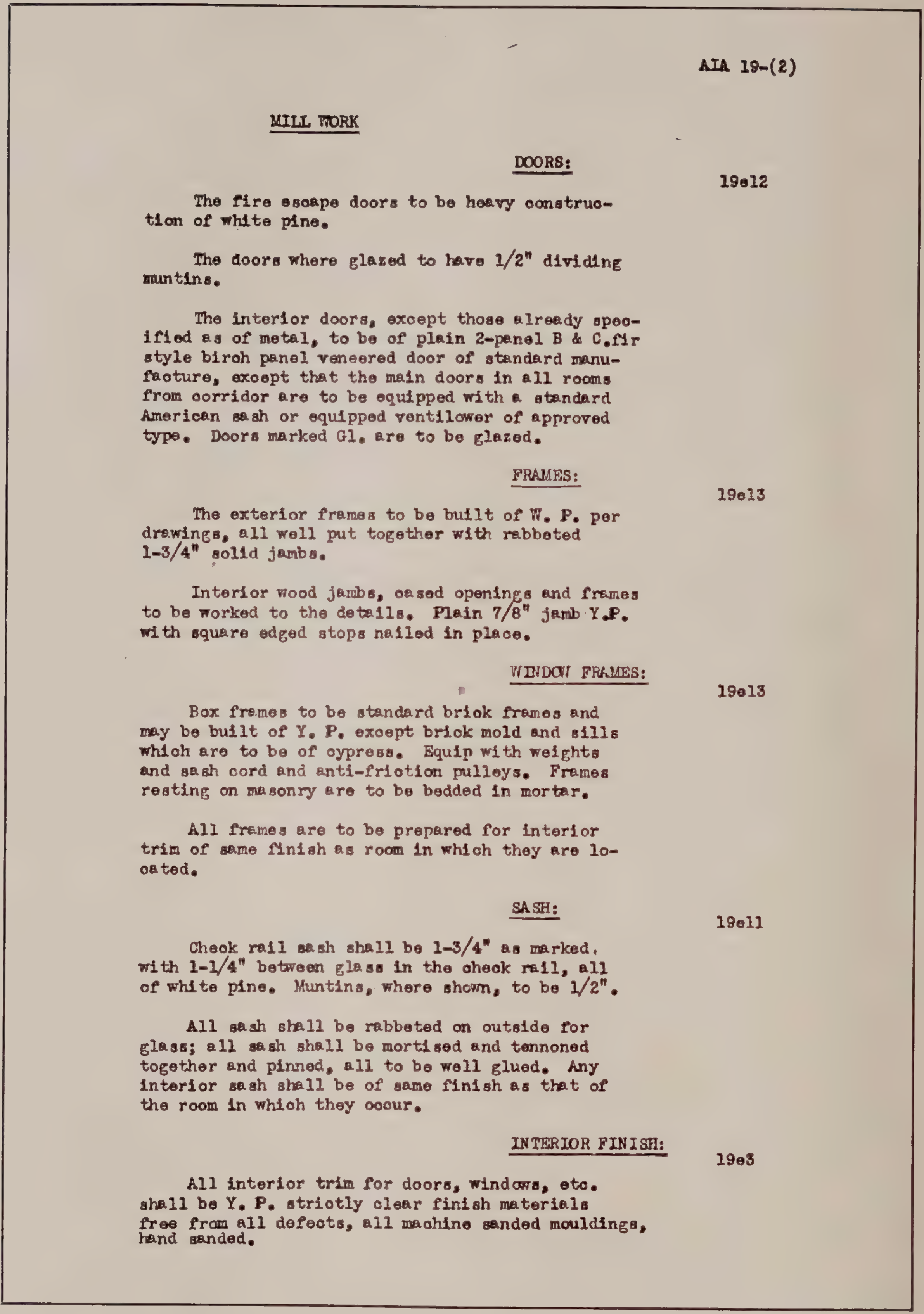
Forms, Wood—4 d 2.

Reinforcing Steel—4 e 22. Identified at a glance, to the initiated, as referring to high carbon steel. Introduce your own numbers as needed, reserving the main classification as a guide.

A plumber desires to figure his work. He turns to the 29th Section. He soon learns that that is where his work is to be found. The metal door man will know he is to look in Section 16, for so his catalog is numbered.

A glance at your own copy of the A. I. A. Document No. 172 and a review of your most convenient specification will indicate the ease of adopting this classification order for your own. The wisdom of the result will prove itself in a short time, especially if this order of specification sequence is extensively adopted. In order are found facility, comfort, strength, precision, assurance and economy.

EDITOR'S NOTE. In order to illustrate one way in which the suggestion may be carried out, we have reproduced in facsimile, at nearly full size, a page from one of Mr. Brostrom's specifications. On the original copy the A.I.A. classification was indicated in pen and ink on the margin. Copies were made by blueprinting. The main classifications are indicated in the upper right corner of each page, in this case A.I.A. 19. The figure (2) indicates the second page of the specification covering Major Division 19. Carpentry.



AIA 19-(2)

MILL WORK

DOORS: 19e12

The fire escape doors to be heavy construction of white pine.

The doors where glazed to have 1/2" dividing muntins.

The interior doors, except those already specified as of metal, to be of plain 2-panel B & C.fir style birch panel veneered door of standard manufacture, except that the main doors in all rooms from corridor are to be equipped with a standard American sash or equipped ventilower of approved type. Doors marked Gl. are to be glazed.

FRAMES: 19e13

The exterior frames to be built of W. P. per drawings, all well put together with rabbeted 1-3/4" solid jambs.

Interior wood jambs, cased openings and frames to be worked to the details. Plain 7/8" jamb Y.P. with square edged stops nailed in place.

WINDOW FRAMES: 19e13

Box frames to be standard brick frames and may be built of Y. P. except brick mold and sills which are to be of cypress. Equip with weights and sash cord and anti-friction pulleys. Frames resting on masonry are to be bedded in mortar.

All frames are to be prepared for interior trim of same finish as room in which they are located.

SASH: 19e11

Check rail sash shall be 1-3/4" as marked, with 1-1/4" between glass in the check rail, all of white pine. Muntins, where shown, to be 1/2".

All sash shall be rabbeted on outside for glass; all sash shall be mortised and tenoned together and pinned, all to be well glued. Any interior sash shall be of same finish as that of the room in which they occur.

INTERIOR FINISH: 19e3

All interior trim for doors, windows, etc. shall be Y. P. strictly clear finish materials free from all defects, all machine sanded mouldings, hand sanded.

SPECIFICATION PAGE, SHOWING A.I.A. CLASSIFICATIONS

THE SUPERVISION OF CONSTRUCTION OPERATIONS

BY

WILFRED W. BEACH

CHAPTER 10. CONCRETE REINFORCEMENTS AND OTHER BUILT-IN MEMBERS, CONTINUED

EDITOR'S NOTE. *The considerations of the placing of reinforcement were taken up in the previous article (October, 1929) and are here continued, the discussion centering on the various provisions made by specification writers regarding the placing of sleeves and boxes.*

A SPECIFICATION writer who is lax in properly correlating these functions should be cautioned and made to correct his practice. The chief reason for having the contractor for each trade provide his own sleeves and boxes is that he is best able to forecast his requirements at the time of compiling his bid and make proper allowances, while a general or concrete contractor must simply guess high enough to be safe. This does not apply to estimating for duct work, the necessary openings for which are generally shown on drawings as of definite sizes and at definite locations. For these and other larger members, wood boxes are ordinarily built into forms so as to be easily removable.

It is not unusual for a superintendent to discover that no adequate provision has been made, however, for treating the interruption of reinforcement due to locating holes larger than the distance between reinforcing members. He must look ahead to this and, if necessary, get special instructions from his home office and see that they are carried out. Hit or miss location of large holes in slabs at the behest of any and every trade is careless practice and not to be tolerated. An experienced superintendent knows that the value of any tension or shear member in concrete lies in its continuity, and that they are not to be cut or deflected without specific instructions. Minor members may be slightly deflected around small holes, but larger holes (depending upon the computed live load and the relation of the hole to the location of the reinforcement) may need special treatment of reinforcement and should be investigated in ample time.

Among the items that must be thus located and maintained in the forms with extreme accuracy are sleeves for all manner of piping, conduit, shafting, ducts, chases, etc.; anchors for veneering; furring, stripping, machine foundations and equipment of every description, boxes for floor-inserts, cabinets of all sorts, etc., etc., *ad infinitum.* The superintendent must familiarize himself with the work to such an extent that he may be sure that nothing has been neglected. The omission, improper installation or accidental displacement of any one of such members spells subsequent grief and probability of undue cutting and patching.

For example, a contract for the installation of an automatic sprinkler system in a reinforced concrete factory building was let as an afterthought by the owner. The pipe anchor inserts were sent to the site by this contractor to be placed by others. The owner, to avoid an extra on the general contract, employed his own house carpenter to set these inserts in the forms, depending upon the architect's inspector to watch him. The inspector checked some, but not all of them. Later, when the pipe setters attempted to make use of the inserts, they found several series to be so out of alignment as to be useless, and, hence much cutting for new anchorage was necessitated, all at the expense of the owner. He was inclined to place all blame on the inspector (where some of it belonged), but was made to see that, in having had work done direct, instead of by the contractor, he was taking to himself the responsibilities that would otherwise have plainly rested upon the latter individual. The architect was fortunate in having a client more than usually amenable to reason.

In accordance with the terms of the specification paragraph which demanded that "a competent mechanic (more, if necessary) shall be exclusively and continuously employed, before and during pouring, in the correcting and replacing of reinforcement and other members to be embedded, which may have been displaced, and shall keep just ahead of the pouring," our superintendent took the earliest opportunity to have the general foreman assign a man of sufficient intelligence, experience and interest in his work to be dependable in the matter of properly adjusting chairs and reinforcing, cleaning and strengthening forms and rectifying everything else that needed attention just prior to pouring. Unfortunately, there was (as ever) a continual temptation on the part of the foreman to consider this man insufficiently employed, but the superintendent used a firm hand and kept control of him. He was especially particular to see that all intersections of members were wired together to the extent specified; that all splices were of requisite length and not in forbidden locations; that all bulkheading was properly done and all concrete and other surfaces in proper condition to receive the new flux; that all open ends of pipe, conduit and wall slots were well plugged, and that all sleeves were similarly stopped, or filled with sand or paper to keep out the concrete. As a result, they had but one case of serious form leakage and but slight trouble elsewhere. There was no effort to "cheat the mix" and, by using this assigned man to make all slump tests, they were able to keep things moving at a good rate.

Some difficulty was experienced later on in the placing of wire fabric in the various slabs where this light weight reinforcement was called for. The men tried to unroll the material in place, but could not eliminate the bends and kinks to the satisfaction of the superintendent who insisted upon their taking it out to the street paving, unrolling and turning it over, then smoothing the curved wires by hand to the degree necessary to permit the mesh to lie flat. By so doing, they found that it would "stay put," and that time was saved with this troublesome material. Many contractors prefer to buy wire mesh in flat bundles, perhaps not so easily handled, but certainly more easily deposited and maintained until covered.

Where anchors are to be set by templates, as for machine foundations, hardware and the like, the superintendent should ascertain well in advance that the templates as well as the members to be embedded are on hand and that the foreman understands just how they are to be placed. Frequently, even a small mistake is disastrous.

CHAPTER 11

WATERPROOFING AND DAMPPROOFING

EARLY in the process of preparing drawings and specifications for a given work, it is essential to determine whether provision should be made for permanently waterproofing or dampproofing any part of the structure. If either is indicated, the designer must decide to what extent such protection is advisable and determine the means to be adopted for the purpose; or he may make certain provisions indeterminate, to be decided after the excavating has permitted a better examination of local conditions.

In the case under discussion here, of a school building in a semi-isolated location on a hillside in a small city, we find these specification clauses pertinent to the subject:

1. Integral waterproofing.
2. Damp courses.
3. Coating of outside basement walls.
4. Drain tile along footings.
5. Membrane waterproofing.

Regarding the first of these methods, it is interesting to note the diversity of opinion as to which of these integrants can be counted upon to function most efficiently:

(a) A diatomaceous or other magnesite or calcite earth or similar ingredient in powder form intended to be dumped into the mixer at same time as the cement.

(b) Slaked or hydrated lime.

(c) A waterproof admixture ground into the cement at the factory.

(d) A liquid waterproofing intended to be mixed with the gauging water.

On the general subject of such types of admixture, it is well to consider certain conclusions reached by the representatives of the Portland Cement Association as published in their "Concrete Data for Engineers and Architects": "Concrete made from properly selected aggregates, combined with Portland cement in suitable proportions, when thoroughly mixed to the right consistency, carefully placed and adequately protected during early hardening, will be watertight under all ordinary conditions."

As essential to the production of good concrete, the Association recommends clean, well graded aggregates, well mixed in proportion of 1:1½:3, with not more than six gallons of water per sack of cement, laid monolithically (or equivalent thereto), well spaded and kept warm and damp for ten days. Architects and engineers, however, continue to specify 1½ to 12 per cent (1½ to 12 pounds to each sack of cement) of admixtures, dependent upon their kind and the richness of the mix. This is done as much, perhaps, to improve the workability and flowability of the fluid mass as to guarantee its later water-repellant capacity.

The contention of the Association that well made concrete is practically waterproof is borne out in many instances. Experienced workers in this material, in localities such as the Missouri River valley, where the subsoil is yellow clay easily eroded, yet firm where undisturbed, do not hesitate to guarantee the watertightness of cisterns, the walls of which consist merely of from ¾ to 1 inch of cement mortar applied in successive coats, the first troweled directly on the clay and each applied with a strong arm.

The specifications for the work we are considering called for a certain integrant "or equal," somewhat to the embarrassment of the superintendent who was approached by several salesmen, each more or less insistent that his type of integrant was equal or superior to all others. Not being pressed for time, he refused to pass upon any of them but referred the subject to the architect who, in turn, declined to express a preference until the contractor himself decided what he wanted to use, which happened to be satisfactory and was duly approved. It was thereafter necessary for the superintendent to see that the concrete poured in outside basement walls contained the requisite admixture.

This was simplified by the fact that the contractor found that the integrant improved workability to a degree that made it economical to use the same mix for all basement pourings.

The specification for a damp course was sufficiently explicit to have prevented any excuse for one's going wrong with it; nevertheless the superintendent found the foreman instructing a laborer to cut the widths of heavy felt in two lengthwise to save material, thus making its width the same as the thickness of the wall. This was corrected, and the material laid its full width of 30 inches, so that the felt would project beyond the face of the wall, inside and out, to member with other waterproofing to be laid later, thus preventing exterior moisture making contact with the wall just above the footings. (See Fig. 10 in The Forum for July, 1929.)

Inasmuch as the soil carried a considerable moisture content, the coating of the outside surfaces of the exterior basement walls was specified as a precaution additional to the use of integrant in the concrete. In order to make such coating effective, it is essential that (1) a substance appropriate to the purpose be used; (2) that it be applied only to clean, dry surfaces; (3) that it effectually covers *all* areas with which earth is to come in contact; and (4) that it extends above grade at top, and down to and is well connected with the damp course lying on the footing shelf. In order to effect these conditions, it was necessary to do much cleaning of the outside of walls and uncovering of the felt, nearly all of which latter had been buried by falling earth. But thorough cleaning was insisted upon by the superintendent, who also made the workmen go over several places where the coating was defectively applied and put on a second coat. It is especially true of waterproofing and dampproofing that no work is better than its weakest part. If either is to be done at all, it must be well done or the whole cost is practically wasted.

The three methods described are inexpensive and effective under ordinary conditions, but each of the two latter can be improved upon, if thought advisable, by increasing the ply of the materials. Instead of a single thickness of heavy felt for the damp course, three or more plies of impregnated felt can be laid (tarred or asphalted), with thorough moppings between. This treatment can then be continued, as membrane waterproofing, over the outside wall areas below grade in place of the liquid application. This is much more expensive, because it is common practice to protect such membrane by from 2 to 4 inches of concrete or other masonry. Plastering it with cement mortar is not good procedure, because the weight of the mortar must be supported by the adhesion of the felt to the wall, and this may easily fail. "Parging" or plastering the wall with a mixture of cement and tar pitch, asphalt or other water repellant (without the membrane) is often resorted to and is probably more efficacious than the fluid application,—at somewhat increased cost. The chief essential, that there shall be no break in the coating, is, of course, best guaranteed by the membrane which should have greater elasticity than other solids, though pitch and asphalt, if of proper quality and consistency, will remain "alive" almost indefinitely when buried, and may re-seal minute fractures.

After examining the subsoil in the excavation, the architect decided that it was advisable to add assurance by installing a line of drain tile all around the outside wall footings. This had been forecasted by an alternative in the specifications, for which the contractor had, in his bid, named an extra of $380. This small cost affords an assurance of temporary protection against pressure of surface water on the walls when seeking an outlet. Owing to the eventual filling of the drains with silt and earth, the safeguard cannot be considered permanent, though the water may continue to run toward the sump in small channels, either inside or outside of the drains. So long as this lasts, there will also be a slight reduction in the upper pressure of moisture under the basement floor. The choking of the drains is partially guarded against by covering the upper half of the open joints (if farm drain tile is used) with pieces of tile, sheet metal or felt; or by the use of hub-joined tile. However, as these joints must be sufficiently open to permit ready seepage into the drain, it is obvious that sediment and roots cannot be entirely excluded. Knowing this, the superintendent saw that the tile were in good condition, properly placed on a natural earth bed, with proper fall, fairly close joints, well covered on top, and the trenches filled with broken stone or coarse gravel to the required height (See Fig. 10 already referred to); also that the sump was constructed as detailed, with proper connections in and out.

Thus was water or moisture that might percolate through the outer walls fairly well guarded against. There remained the possibility of infiltration through the basement floor. It was assumed that the footing drainage would serve to prevent this, except, perhaps, in the deeper section housing the boiler room. All basement floor slabs were, nevertheless, waterproofed integrally in the same manner as outside walls, and were laid on sand cushions which would absorb a moderate amount of moisture and slightly check its pressure. If the anticipated "head" of water had been somewhat greater, or if in the basement there had been wood floors, which are particularly susceptible to the influence of dampness, something more positive would have had to be done. In such event (as where gymnasium floors are laid on the ground), it is often advisable to use membrane waterproofing or to lay hollow tile, with dry joints, under the concrete slab, which latter can then be reduced in thickness enough to compensate for part of the cost of the tile, as it need only be thick enough to afford secure anchorage for the floor sleepers or bedding for the wood blocks, as the case may be. Whatever is done in this particular, it is important that the protection shall be extended under the interior basement walls and partitions, if these are of concrete, brick or tile, to prevent capillarity. The protracted drying out of such masonry has been known to produce a vertical suction lasting through many months or even years, making it impossible to stop the staining by painting or by other usual methods.

The fifth method of waterproofing called for was for the membrane to be built into the floors and walls of the swimming pool. This served the dual purpose of keeping the ground water out and the tank water in, and was specified to consist of consecutive layers of impregnated felt containing a fabric, mopped under, over and between all layers, and with an added ply at all corners. This was covered with a flat layer of brick on the floor and 4-inch brick walls on the sides, on which the tile bed was laid in each case. This work was carefully done and supervised.

Waterproofing and dampproofing are more or less interchangeable terms and practices, though some authorities differentiate them by insisting that the former term be applied in all cases where the moisture exerts a pressure against the surface to be protected. Where this is the case, the method of waterproofing should be determined by an expert and should vary as the degree of pressure that is to be counteracted. Such designing is not a function of the superintendent, but he should so acquaint himself with current practice and local conditions as to be able to form an opinion as to the adequacy of what is provided for in the contract and to intelligently advise the architect, if called upon to do so.

A sixth method of waterproofing is sometimes used in tunnels, subways and other sub-aqueous construction,—more often where the method originally provided has failed in more or less degree. It consists in locating the leaks or "weepy" places on the inner surfaces of the defective walls and enlarging the places in such manner that the seepage throughout small areas can be directed to central points by means of porcelain tubing or otherwise. The surface around the tubing is then effectually waterproofed and the outlet tube later cut off and plugged; or, in some instances, where the pressure is too great to be thus repelled, the seepage is conducted by means of these built-in tubes or arteries to permanent drains, in similar manner to the draining of "weep" holes back of wall surfacing.

CHAPTER 12

FINISHED CONCRETE SURFACES

THE finishing of concrete surfaces falls naturally into two classes: (1) for wearing surfaces and, (2) for all other exposed areas. Each may be of character, composition, texture and color to suit the usage or purpose for which it is intended or to satisfy the idea of the designer. For the school building under discussion, we find a concrete base around the outside of the entire building, specified to be uncoated, but with all ridges and other inequalities left by the forms to be rubbed down (before the concrete has acquired its final set) with blocks of carborundum or of concrete of the same mixture as that called for in the walls. In order that such surfaces might come out as smooth as possible, the superintendent gave special attention to the operation of "spading" the flux; i. e., agitating the wet mix against the outside of the forms, as soon as deposited, with a flat tool (sometimes called a "straight hoe"), thus working the larger aggregate back and allowing the finer material to flow smoothly against the forms. This should prevent all pitting of the surface and produce planes as smooth as the boards of which the forms are constructed. Any carelessness in this spading will show plainly when the forms are removed and will necessitate patching of the surface. This is generally forecasted in the specifications by the stipulation that "immediately after the forms are removed, all rough places in the concrete shall be dressed off (or rubbed, as just explained), all bonding and tie-wires cut back from the surface, and all voids and pits filled in flush with 1:2 cement mortar, and all exposed surfaces left in smooth and acceptable condition."

Such a specification is, however, scarcely sufficient. Wall forms should be removed as soon as it is safe (in about two days in summer and four in cold weather), in order that the concrete may be finished while still green. Then, "the superintendent shall be given opportunity to inspect the exposed surfaces. All damages due to improper mixtures, insufficient rodding, premature drying or other cause shall be made good by the Contractor to the satisfaction of the Architect. All pits, spalls and loose aggregate shall be picked out and cleaned as directed, grouted and smoothly patched as specified."

This work should be done most carefully, else the patches will show, perhaps bond poorly, and later freeze off. To prevent this, the walls should be kept moist (as is elsewhere specified) and the places to be patched treated with rich grout or bonding cement. All such patches should be attended to most promptly in order that they may acquire initial set in time to be rubbed at the same time as adjoining surfaces. Workers who are adept finishers will produce walls that need no patching, and hence can use sand floats on the wet surfaces a day sooner than when waiting for patches to set. Done with fine sand and plenty of water, this method is quite as effective as that done with blocks. It lies with the superintendent to determine when such treatment, by either method, has been carried on long enough for the intended degree of smoothness.

Other methods of surface treatment are by various kinds of hand or machine tooling, as for cut stone, or by sand blasting with compressed air and fine sand. Specimen areas are, in such cases, submitted for approval, and the superintendent must be the judge of whether all areas so treated match the approved sample. There appears to be an increasing use of monolithic surfaces as just described, many architects even leaving the concrete entirely untouched, after the forms are removed. When this course is intended to be taken, one must make sure that the form work is in exact shape to produce the desired results, especially that the lines of demarcation between successive pourings do not appear in undesirable places. Sometimes false joints are called for, and strips are nailed inside of the forms to produce such an effect. All construction joints should then be made to occur at these strips and thus rendered invisible in the finished work. This is really imitation stone, not often called for. Such design is more frequently executed in pre-cast blocks.

Although the use of exposed concrete surfaces is apparently increasing, there are still many designers who specify the application of cement plaster or stucco to the rough concrete, especially if some unusual color or texture is sought. This is properly applied in three coats to a total thickness of not less than ¾ inch, "the first two coats to be composed of one part Portland cement (to which has been added 10 per cent of hydrated lime) and 3 parts of well graded clean sand. All surfaces to be plastered shall be thoroughly cleaned, picked free of loose aggregate, well brushed, drenched with clean water and dashed with 1:1½ 'soupy' cement grout, which shall be allowed to thoroughly set before plastering. The surfaces shall then be well moistened and the first coat troweled on hard and tight and well scored. This shall be kept moist 24 hours, then allowed seven days for drying, then moistened and the second coat applied, rodded straight and true in every direction. The third coat shall be an approved make of exterior stucco, from ⅛ inch to ¼ inch thick, well troweled on and finished like an approved sample."

The chief objection to exterior plastering on concrete is the prerequisite of extreme care and expert workmanship, lacking which the finished material may soon show fine cracks and eventually spall off. This is especially true where it is subjected to freezing conditions. Since exterior stucco is chiefly used as a cheap covering for tile walls and their imitation done in lath and studding, it would appear to be wasted in the disguise of more permanent construction. However, when he finds stucco designated, it is not a function of the superintendent to reason why, but to see merely that it is up to specification requirements, properly mixed and correctly applied to properly prepared surfaces.

Ornament and run-moulds are frequently used in connection with exterior plastering and need very close supervision, whether pre-cast or worked in place. Ornament cast in place demands the most careful manipulation of the flux in the forms, use of all coarser aggregate being entirely eliminated. The "waste moulds," in which the actual ornament is formed, are first submitted for approval, and hence one is thereafter concerned only in the mechanical process of filling the forms. The sheet-steel templates, used by plasterers in running mouldings, should also be submitted to the superintendent and compared with full-sized profiles on detail drawings.

Floor and paving slabs intended to have a finish coat of cement mortar (ordinarily called "cement finish") are variously specified but, more often than not, it is sought to have the surface made monolithic with the slab by demanding that the top coat or "topping" be laid "before the concrete has had time to set," then floated or troweled as required. With slabs laid on the ground, or with roof slabs above which there is no further construction work, such a process is not difficult. But it is quite impracticable to lay monolithic topping on intermediate slabs over which the workmen must proceed with the form work for the floor construction next above. For such floor finish and for terrazzo and other finish materials laid in cement mortar, a special proviso must therefore be incorporated in the specifications, to the effect that "the slab shall (if so directed by the Superintendent) be rough-picked and cleaned by means of water and steel brushes and kept thoroughly wet with clean water for six hours before laying topping. All such contact surfaces (rough, clean and wet, but without free water) shall be thoroughly covered with a thin coat of neat cement grout, applied shortly before the topping is deposited."

The need of exercising every precaution to insure a good bond between the topping and the slab cannot be exaggerated. Imperfect bond and improper troweling of the surface are the most prevalent faults of concrete floor finishes. Troweling is work for experts only. These know just when the quaking surface is right for attack, and proceed accordingly, regardless of when the whistle blows. Specifications should take cognizance of this and provide that "overtime labor shall be provided by the Contractor, without extra charge, whenever necessary to properly complete such unfinished areas." If there is any slip-up on this, the superintendent should act promptly and should have the entire topping removed before it sets, rather than allow it to harden without correct finishing. Some concrete finishers like to hasten the absorbing of surface water (which should have disappeared before troweling is begun) by dusting neat cement into it and troweling at once. This is forbidden in better specifications, as is the troweling in of the laitance. Either might be the cause of dusty wearing surfaces. It is frequently better to save troweling (and even topping) by specifying that it be omitted in all unfinished or unused areas, such as pipe spaces, dead storage areas, tunnels, cheap cellars, etc., providing merely that the surface of the slab be evenly floated to exact plane level with screeds. Such surfaces can even be troweled by one who knows how. Excellent sidewalks and railway platforms have been constructed in this manner. Concrete paving is generally left "under the float," the rough surface being better than the smooth.

The thickness of topping varies from a ¼-inch skim coat under roofing and other waterproofing to 2-inch or even 3-inch, depending upon design and other conditions. A ½-inch coat would be ample in all cases, if one could be sure of getting the monolithic bond called for; but one is so uncertain of this, so sure that there will be places where it can't be done, that a minimum of ¾-inch is the rule, a 1-inch topping being most commonly specified. However, if one is guarding against bond failure, the 1-inch thickness is not enough better than ¾-inch, and hence in better class work, architects and engineers allow from 2-inch to 3-inch for the finish on top of reinforced slabs. This simplifies construction in many ways, even permitting the running of conduits on top of slabs. Thus 2½-inch was the allowance above slabs in this school building in the entrances, corridors and toilet rooms and in the laboratories in the third story. Elsewhere, above the basement, the allowance was 1-inch, just sufficient for the laying of wood block flooring in mastic. If use of ordinary flooring, laid on sleepers, had been contemplated, the 2½-inch allowance throughout would have been a still more straightforward method. This is about right also for laying of tile, marble or terrazzo. It means a dead load of 30 pounds per square foot where these materials or concrete topping are used, though this can be reduced about 10 pounds by the use of cinder concrete for the bed. In any case, the bed and topping must be laid practically simultaneously or nothing is gained by having increased the thickness above the slab. Further precaution was provided against cracking of these school house floors by the insertion of light-weight wire mesh in the concrete bed. (See Chapter 10.)

Terrazzo, as used for floor finish, is a high grade concrete in which the coarse aggregates are colored marbles, selected to produce an intended design or color scheme, at times worked into beautiful mosaics. Naturally, it has a wide range in price, depending upon the kinds of marble used, the patterns in which it is laid, the amount of brass dividing strip used, and (because of the transportation of men and special equipment) the total square footage required. Good terrazzo can be produced at moderate cost by the use of cheap domestic marbles and is greatly to be preferred to the ordinary cement-mortar topping, because of its appearance and its greater cleanliness. Perhaps the chief trouble with terrazzo at the present time is a lack of uniformity in architects' specifications for the material as well as in those of the producers themselves.

"For instance, one manufacturer's specification calls for the surface of structural slab to finish 3 inches below plane of finished floor. On this is laid ¼ inch of sand and a thickness of tar paper, obviously to keep the sand from combining with the underbed of the terrazzo. Thus we have an effectual cut-off that should prevent the transmission of cracks in the structural slab through the finished floor resting on it; 2 inches of underbed (1:4 cement mortar) is laid on the tar paper and the ¾ inch of terrazzo deposited thereon and made monolithic therewith.

"Another manufacturer issues a detail of the same kind of construction and formerly recommended a specification to fit the detail, but has since changed it to read: 'A properly concreted floof, finished to within 1½ inches of the finished level, shall be provided under another contract.' Upon this he lays ⅞ inch of screed coat and ⅝ inch of terrazzo and makes no mention whatever of a sand cushion. Still another calls for 2 inches of 'sublayer' and ½ inch of finished terrazzo. So we have the finish varying from ½ inch to ¾ inch in thickness and the underbed from ⅞ inch to 2 inches, either cemented to the structural slab or separated from it. Evidently, neither is perfect nor crack-proof. The best reliance seems to be upon the brass strips. If cracks must be, let them be where they will be the least noticeable.

"The National Terrazzo and Mosaic Contractors' Association (headquarters in Milwaukee), has recently adopted what is intended to be a standard terrazzo specification which calls for a ¾-inch terrazzo mixture on 1¼ inches to 2¼ inches of concrete bed, the latter to be cemented to the under slab with cement grout (or, on wood sub-floor, to be deposited on waterproof paper). To what degree this specification will be generally used remains to be seen. The surface on which the 'underbed' is to be deposited should be swept clean and drenched, as otherwise it is likely to suck the moisture out of the concrete and leave it granulated. If it is deemed advisable to have the terrazzo slab adhere to the structural, a bonding cement should be used. If there is no adherence and if there are places where the terrazzo is thinner than intended (due to inequalities in the structural slab), it may later separate enough to give forth a hollow sound under foot and eventually break. It is up to the superintendent to *know* his terrazzo."*

It should be borne in mind by the designer who likes to create patterns with the brass strips that their chief purpose is not to prevent cracking but to render the cracks as nearly invisible as possible. Inasmuch as cracks in structural slabs (which are the chief cracks to be guarded against) are to be looked for parallel to the direction of structural members and at right angles to them, it is obvious that these are the directions in which the strips should run. If laid in diagonals or arcs, they serve only as pattern members and, if cracks occur, they will ignore such strips and be plainly discernible.

In this school, terrazzo was called for in the vestibules and entrance lobbies (for floor field, border and base), in the bathrooms, locker rooms and toilet rooms (for field only, tile being used for base and wainscot and in the pool), for border and base in the corridors above the basement, and for field and base in basement corridors. Above the basement rubber tiling was used for runways in corridors. Fillers 1½ inches thick in all stair treads and platforms were of terrazzo between the first and second stories and of cement mortar elsewhere. In all cases, both the terrazzo and cement-mortar filler contained a non-slip aggregate, which was also specified for the floors of bathrooms and areas surrounding the pool. This is dusted into the topping, one to two pounds to the square yard, and the superintendent must see to its uniform distribution prior to the troweling. If incorporated in the original mix, a much larger quantity is required.

Various methods are in vogue for improving the surface and wearing "life" of concrete floors, such as using "hardeners" to be mixed with the aggregates, added to the gauging water or dusted into the surface. Whichever is specified, the superintendent must familiarize himself with the maker's requirements and know that they are being carried out. If such work is done by others than the producer's own trained men, he may have to supervise the education of the contractor's employes in order to secure satisfactory results. Again must he guard against assuming too great responsibility in such procedure. He must make sure that all responsibility rests on the contractor, both as to all construction work of every description that is to be covered by floor surfacing and as to its suitability to receive the kind of material that is to be laid thereon. This is especially true of proprietary brands of surfacing, such as the various types of so-called "sanitary" flooring. Owing to the many failures of such topping, it is seldom incorporated in an architect's specification, except to be laid by the maker's own men and methods and under a most rigid guaranty. Even so, there is laid on the superintendent the customary obligation to know as best he may that the owner is getting what he is paying for; that surfaces are even as to texture, tints and planes; and, if the same material is used for base, that all lines and arrises are true and that cove and top are truly formed.

Our superintendent was fortunate in securing excellent coöperation from the contractor's general foreman, but he found that, as usual, he had to keep constant watch over sub-foremen and their men, many of whom were ever ready with the excuse that they "had always done it that way and that no one had told them that this job was any different" One such was heard to say: "No matter what I do on this job, when I look at the specifications, I find it ought to have been done some other way" On any work that is intended to be just a little better than the average, this is quite likely to be true, and hence the importance of a man's familiarizing himself with the specifications is impressed upon everyone having to do therewith.

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*Quoted from "Specifications for a Hospital", by W. W. Beach Pencil Points Press, New York, 1929.

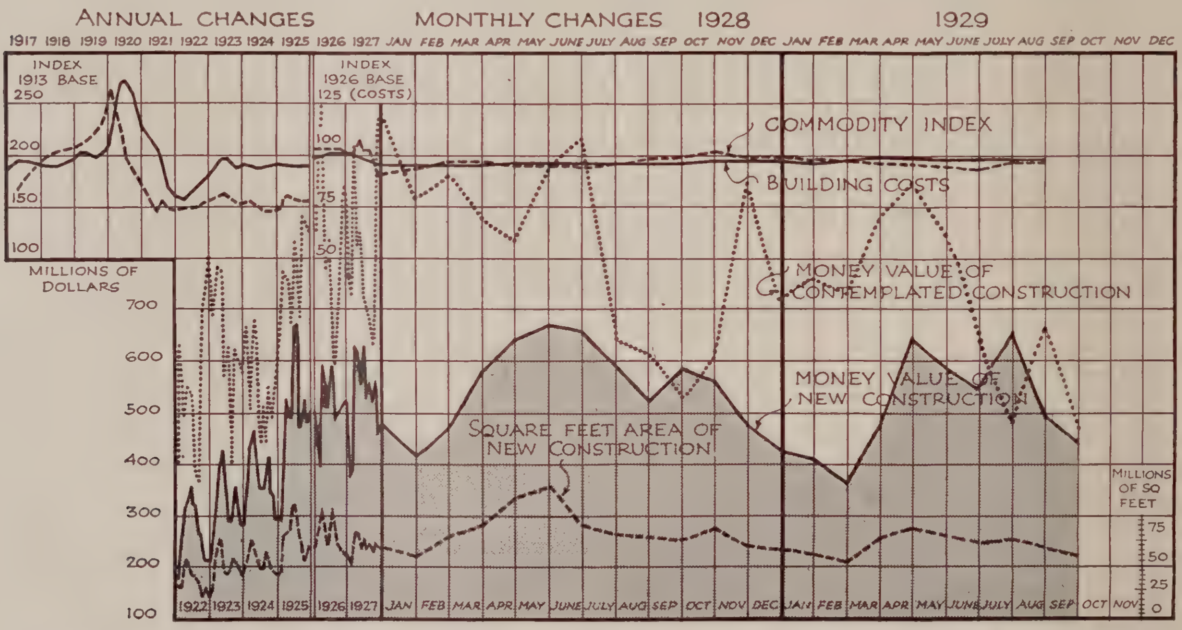
THE BUILDING SITUATION

A MONTHLY REVIEW OF COSTS AND CONDITIONS

CONTRACTS awarded for September construction, amounting to $445,402,300 in the 37 states east of the Rocky Mountains, show a decline of 9 per cent from the value of contracts awarded during August, and 24 per cent from that of September a year ago, according to the F. W. Dodge Corporation. While at first glance this would seem to indicate that September construction was far below normal, it should be borne in mind that the normal construction year shows a seasonal falling off of around 6 per cent between August and September. In view of this, the decline of 9 per cent for this past September is not extreme. The unusual falling off of 24 per cent from figures for September, 1928 is largely accounted for by the abnormal increase which took place in 1928, which was just the reverse of the normal seasonal trend. Contracts awarded for the first nine months of 1929 amounted to $4,602,267,600, having fallen off approximately 10 per cent from the figures for the first nine months of 1928. In the district comprising New York state and northern New Jersey, September contracts amounted in value to $81,222,500, which is 14 per cent under the August figure and a decline of 48 per cent from that of September a year ago. For the first nine months of this year the contracts awarded in this district amounted in value to $1,083,134,200, a decline of 20 per cent from figures for the same period of 1928. In the New England states work totaling $34,297,700 was started in September. This was 3 per cent ahead of the August contracts, but 52 per cent behind September of last year. For the first nine months 1929 showed a total of $318,247,800.

In the middle Atlantic states, September construction, with a total value of $48,822,200, was 7 per cent ahead of August, but 25 per cent below September, 1928. For the three quarters ending with September, the construction started amounted to $557,215,900 and represents a falling off of 8 per cent from the first nine months of last year.

While the total construction for the first nine months of 1929 is still 10 per cent below the 1928 figures for a corresponding period, it is interesting to note that as the year progresses each quarter makes a better showing than that preceding. At the end of the first quarter, for instance, 1929 construction was running 16 per cent behind that of 1928. For the second quarter, 1929 was only 9 per cent behind, and now the third quarter is only 6 per cent below the third quarter of the last year.



THESE various important factors of change in the building situation are recorded in the chart given here: (1) *Building Costs.* This includes the cost of labor and materials; the index point is a composite of all available reports in basic materials and labor costs under national averages. (2) *Commodity Index.* Index figure determined by the United States Department of Labor. (3) *Money Value of Contemplated Construction.* Values of building for which plans have been filed based on reports of the United States Chamber of Commerce, F. W. Dodge Corp. and *Engineering News-Record.* (4) *Money Value of New Construction.* Total valuation of all contracts actually let. The dollar scale is at the left of the chart in millions. (5) *Square Foot Area of New Construction.* The measured volume of new buildings. The square foot measure is at the right of the chart. The variation of distances between the value and volume lines represents a square foot cost which is determined, first by the trend of building costs, and second, by the quality of construction.

SUPPLEMENT TO THE ARCHITECTURAL FORUM
NOVEMBER, 1929

SPECIAL NEWS BULLETIN

STOCK MARKET BREAK WILL HELP BUILDING INDUSTRY, LEADERS REPORT

In order to interpret quickly the effect, if any, of the stock market break on the building industry, telegrams were sent Wednesday, October 30, to more than 200 representative manufacturers throughout the country asking for an expression of opinion. We print below as many replies as could be included before mailing the November issue of The Architectural Forum. The opinion is widely held that through curbing speculative activity, money will be available for carrying out building operations on a large scale.

American Gas Ass'n.

In our opinion recent events on the stock market will result in lower cost of money, thereby making possible greater building activity heretofore deferred because of high cost of financing. Business conditions unquestionably fundamentally sound.

Alexander Forward,
Managing Director.

Andersen Lumber Co.

Recent investigations that are personally made on extended trip indicates to me that low points of residential building have been passed. However, home buyers will be more discriminating than formerly and demand quality materials and workmanship more than ever before.

Fred C. Andersen.

York Heating & Ventilating Corp.

Absolute soundness of basic conditions makes me feel release of money held in market by previous high call loan rates will allow buildings requiring mortgage money to proceed, and business should be as good or better than in the past two years.

Thornton Lewis, *President.*
Also *President* American Society of Heating and Ventilating Engineers.

Albert Pick-Barth Co.

Business on entirely too substantial a basis to be hurt. The lessening of demand for funds used for stock market purposes and the availability of money for business operations will certainly be helpful. Our program, calling for new branches and expansion as well as sizable increase in advertising appropriations, will proceed as heretofore planned. Stock market reaction healthy. Hope for quiet market with sensible recovery, so as not to again induce speculation. Too many salaried individuals endeavored to make their fortunes gambling, instead of old-fashioned effort through business pursuits. Re-establishing the principle of slow, steady, solid growth is one of the gainful effects. Certainly see no reason for pessimism.

Richard Ratner, *President.*

American District Steam Co.

From our viewpoint business was never on a more sound basis or country's credit facilities more stable. Our business exceeding expectations for this season of the year and future outlook never was brighter. The country has gone speculation mad. I believe present nervousness of minority purely psychological and that the stock market depression will soon be forgotten.

Robert Hall, *President.*

Trimpak Corp.

Replying your wire, last few weeks placements indicate retail stocks are so extremely low that the least volume of residential construction enforces buying. Recession in building construction last few months has decidedly improved antiquated methods of merchandising homes. If stock market drop releases money for mortgages to support this improved selling, we will expect marked improvement in business for manufacturers supplying residential construction.

Harry J. Strong, *Secretary.*

Creodipt Co., Inc.

Business is fundamentally sound and the stock market reaction will surely release funds for home construction. There is as much money in the country today as there was before the stock market slump, and we are sure many who have hesitated to invest their money in a home now realize money put into real estate can not be swept away over night. We are confident the building industry will receive great impetus as result of the leveling of stock market prices. Building material costs today are as low or lower than they have been for many years, and many will take advantage of present situation because stock market speculation certainly has become unattractive.

H. E. Gosch, *President.*

Affiliated with BUILDING AGE, HEATING AND VENTILATING, GOOD FURNITURE AND DECORATION and BUILDING MATERIAL MARKETING

Pratt and Lambert

In our opinion business conditions in the paint and varnish industry are very satisfactory. We anticipate good buying for balance of year. Dealers' stocks are small, with good turnover for spring. Business is splendid. Believe present readjustment of security prices will have beneficial effect on the building industry.

A. D. GRAVES, *President.*

Ric-wiL Co.

Our business indicates building industry going right ahead regardless stock market situation. We believe building industry is benefited by this readjustment of values which was inevitable and necessary.

C. GOTTWALD, *President.*

Richmond Radiator Company

The building and allied industries should be benefited more than hurt by the forced Wall Street liquidation of the past few days. Capital should soon be available for legitimate business, particularly for residential building.

W. G. LANGFORD, *President.*

James P. Marsh and Co.

Our sales and prospects booked will make the last quarter of 1929 the largest in the history of James P. Marsh & Company. Regard the readjustment of the stock market as stabilizing and releasing of funds for investment, with added impetus to building industry in all lines.

ORVILLE W. THOMPSON.

Peerless Unit Ventilation Co.

From our viewpoint as manufacturers of heating and ventilating equipment, we can see absolutely no reason for alarm because of the present stock market situation, which we believe is purely temporary. We are confident that our industries will not be affected in the least and are proceeding with our preparations for increased production and sales for 1930.

M. J. CALLAHAN, *President.*

Illinois Engineering Co.

Replying to your wire we believe the collapse of the stock market definitely ends the speculative wave which has engulfed the country and will prove a distinct benefit to the building industry, by returning funds from stock and call money operations to legitimate building projects.

ROBERT L. GIFFORD, *President.*

Skinner Bros. Mfg. Co., Inc.

See no reason for any worry. Business conditions better than last three years.

Whitlock Coil Pipe Co.

We have confidence in the stability of business and continued prosperity of the country. Recent developments have not shaken our belief in the fundamental soundness of the country's industries.

J. L. GOODWIN, *President.*

Watts Regulator Company

We view situation with absolute confidence. Business conditions are sound as a whole throughout the country. This we know, as our products are sold from coast to coast. We have received no cancellations during panic. We believe that with the sound business conditions that exist throughout the country that stock depression can not be of long duration.

McDonnell & Miller

We are just completing the biggest month in our history. The entire year so far has been ahead of all former years. Outlook and prospects for immediate future encouraging. We expect to go right ahead as we see no sound reasons for alarm in our industry.

E. N. MCDONNELL.

Heating and Piping Contractors National Association

I see no bad effects from recent panicky stock conditions for our industry, but on the contrary expect that there will be improved building conditions in near future.

HENRY B. GOMBERG, *Secretary.*

S. T. Johnson Company

The oil heating industry, now enjoying the most successful year of its history, is built on the foundation of modernization and efficiency, having graduated from the class of luxuries and will hold its place in all sound revaluation of the country's wealth and help in a larger, better building program that is coming in American business.

J. C. JOHNSON, *President.*

Armstrong Machine Works

Fundamental business conditions as reflected by our volume of sales to all classes of industry were never better than now. We see no reason why business should not go forward as usual.

Central Supply Association

While the correction of stock market has consumed the savings of thousands of wage earners the power to earn and save has not been greatly impaired. With credit released from stock market more funds will be available for building loans. Prices for plumbing, heating and other building materials are reasonable. Labor is ready to give a full day's work. Real estate, particularly homes and small apartment buildings, will soon be in greater demand.

W. E. MCCOLLUM, *Secretary.*

H. A. Thrush & Co.

We have confidence in the future of the building industry in this country. Liquidation which is taking place in the general stock market will, in our opinion, make for more favorable financing in connection with the building industry generally.

President.

Vilter Mfg. Co.

Despite the decline in paper value of various stocks business seems, from our point of view, to be on a basis essentially sound. We record no cancellation of orders nor is there anything in the situation which makes us fear for continued prosperity of business in general.

The Cleveland Gas Burner and Appliance Co.

The fundamental business conditions of the country today are absolutely sound. Manufacturers of heating and home building essentials can now justly look forward to an improved condition brought about by the unfortunate stock market crash, which will now cause the general public to invest in home building, instead of gambling in the stock markets. Extravagance in the purchase of unessential commodities and luxuries will be somewhat curtailed. There is absolutely no cause for alarm.

HARRY E. KERR, *President.*

General Air Filters Corporation

Am viewing the stock market situation with satisfaction and confidence. Speculation will be discouraged and shortly will revert to investments and trade channels, such as the building industry with its allied market.

JOHN HELLSTROM, *President.*
Midwest Air Filters, Inc.

Carrier Engineer Corp.

Contracting as we do with hundreds of manufacturing industries as well as with those who are responsible for public and private building expansion, the economic situation in the country appears to us to be on a most sound and rational basis. We are in no way alarmed by present speculative readjustments. We are not retrenching, but are expanding to meet the healthy growth of national and international commerce.

Hess Warming and Ventilating Co.

The building industry has been severely hurt by not being able to compete for money with stock speculators. Also surprising how many persons have had their minds taken away from their regular work by speculation. Now that people realize there is no more easy money, we look for more attention being paid to normal affairs, with very much less expense in getting building loans. This cannot but help the building industry.

Walworth Company

Incoming orders at all Walworth plants for October exceed September and there is no sign of a let-up. Every factor points to a fourth quarter showing in line with the steady improvement in earnings which the company has made throughout the year. Third quarter statement will be ready for publication within the next few days. Cheaper money should be favorable to the building industry.

HOWARD COONLEY, *President.*

Ramp Building Corp.

We think that present activity will not only continue but show very substantial increase in construction for 1930. The recent stock market slump has released funds which will be available for building finance and other legitimate purposes. We look for a great increase in multifloor garage construction in 1930.

FRED W. MOE, *President.*

Rome Brass Radiator Corp.

The business situation in this country is not made or destroyed by conditions in the security market. Prosperity does not depend on the price of stocks. Fundamentally, the business structure of this country appears as sound as at any time in history. What we need is more sound thinking, a return to productive work, and less speculative hysteria. Our own business is steadily showing a very satisfactory increase over last year and we can see nothing in the immediate future to seriously jeopardize either prospective operations or earnings.

When the present speculative obsession ceases—as we believe it soon will—we feel conservative, sound thinking investors will put their money into high-class building investments, one of the safest securities possible.

JAMES D. ERSKINE, *President.*

Nash Engineering Company

Replying to your telegram, indications point to continued fine business.

IRVING C. JENNINGS, *President.*

Holophane Co.

Believe economic situation nationally absolutely sound, although perhaps temporarily somewhat affected by recent stock market. Our business unimpaired so far and 50 per cent ahead of last year. As an expression of our confidence in the future, we are right now increasing factory capacity considerably.

CHARLES FRANCK, *President.*

Copper and Brass Research Association

We feel that a large volume of building construction will be maintained for the remainder of this year and through 1930. While some falling off may occur, especially in residential building which has been extremely active during the past few years, no general or marked depression is anticipated.

J. L. Wing Mfg. Co.

Believe building and allied industries will be affected favorably rather than otherwise. Nothing has happened to change sound industrial conditions and anticipate a very satisfactory 1930.

A. E. SEELIG, *President.*

General Cable Corp.

We view present situation in our industry with entire confidence and believe funds will be readily available for building operations next year. Stocks of goods are comparatively small and prices in our particular branch of the industry have not been inflated.

H. Y. DYETT, *President.*

Detroit Steel Products Co.

Fundamental business conditions excellent. Believe outlook for future business improved by recent stock market stabilization. Credit will be diverted into business that will be of permanent value.

V. F. DEWEY.

Cohoes Rolling Mills Co.

Your telegram received. Believe continental condition never better and prospects for same good. Business exceptionally bright.

Steel Frame House Company

Our survey shows excess of families over dwellings has increased yearly from about 10 per cent in 1900 to about 17 per cent in 1929. This condition and with loaning institutions looking with favor upon more liberal financing on good construction, we believe that conditions are sound for increased activity in the building industry.

E. H. MILLARD, *President.*

Cassard Romano Co., Inc.

Replying your wire we are not at all alarmed at situation and are convinced that business will continue at satisfactory level.

MORRIS CASSARD, JR., *President.*

Kittinger Co.

We view the future business outlook with utmost confidence. The present deflation and stock values is a natural economic change. Stocks should revert to their true earning value to make business conditions sound. We are preparing for a good business year in 1930.

FRED J. BATSON, *Vice-President.*

The Duraflex Company

Business unquestionably sound fundamentally. Our outlook very good. Consider stampede foolish as always.

Servel Inc.

Recent happenings in stock market will have sobering influence on trading and perhaps to some extent on business, but we believe the fundamentals of the present business structure are sound and view with confidence the prospects for 1930 business.

FRANK E. SMITH, *President.*

Philip Carey Mfg. Co.

We believe in fundamental soundness of business. There is ample credit and money in the country to carry on, therefore feel entirely optimistic as to the future.

G. D. CRABBS, *President.*

Brasco Mfg. Co.

Our faith has not been destroyed. Industry is fundamentally sound. Stocks will promptly adjust themselves to fair values. In meantime more money will be available for building than ever before. We view outlook optimistically, feeling confident our own business will continue at present or even greater rate of growth.

The American Hdwe. Corp.

We believe that fundamental conditions are so sound that the building industry will not be materially affected by the decline in the price of stocks. It is even probable that after the financial interests have adjusted themselves business conditions in our industry may be improved by the release of money and credit for construction heretofore otherwise employed.

GEORGE T. KIMBALL, *President.*

Sargent and Co.

In our opinion decline in stock market will have a favorable result on business over a long range period. Credit and funds which have diverted into stock speculative channels will be available for business projects, including building operations.

MURRAY SARGENT, *Secretary.*

Aluminum Co. of America

Our contacts with the building and other industries lead us to believe that fundamental business conditions are sound. Temporary or local setbacks may occur this fall or in 1930, but business as a whole should move forward.

ROY A. HUNT, *President.*

Heatilator Company

The desire for modern homes provides a ready market for the conservative, efficient builder. The prospects of easier financing indicates more home building by owners and developers. Heatilator values, present and prospective, very satisfactory. Inquiries looking to next season's building largely in excess of any previous period.

W. E. JAQUITH, *Secy. and Treas.*

American Telephone and Telegraph Company

In response to your inquiry the business prospects of the Bell Telephone System are as good as they ever have been and we look for continued growth and expansion.

WALTER S. GIFFORD, *President.*

C. A. Dunham Company

Industry within our observation evidences a healthy contrast to the present stock market condition. Fundamentally all is well. Stock prices will balance with earnings. Bonds for construction purposes will again be sought by the conservative investor.

C. A. DUNHAM, *President.*

Jenkins Bros.

Replying to your telegram October 30th, during the past two weeks we have secured a very satisfactory volume of business in valves for new construction, with prospects of a continuance of the good business we have enjoyed during this year.

Consolidated Ashcroft Hancock Co., Inc.

Our close contact with nearly every industry throughout our country is such that we feel no hesitancy in stating our belief that industry is on a very sound basis and will continue to show satisfactory progress.

Berger Mfg. Co.

We believe the building industry for the balance of this year will be normal in every respect. Indications show prospects for an excellent building year in 1930, with stability of the building industry practically assured.

BUILDING DIVISION.

The Trane Co.

Believe present business situation most promising and that market adjustment opens the way for real building next year. Present year has been good and will continue.

REUBEN N. TRANE, *President.*

The American Laundry Machinery Co.

Answering your telegram of this date, our judgment is that general business will not be affected by present stock market action, particularly if it results in easier money, thus freeing capital for constructive and expansive purposes. We have every confidence in immediate future and are conducting our business accordingly.

L. Sonneborn's Sons Inc.

We believe the happenings last few days have been a necessary corrective operation. The ultimate effect on legitimate industry and business can only be beneficial. In our organization we are looking forward with every confidence to continued good business.

DR. FERDINAND SONNEBORN,
President.

Hoffman Specialty Co., Inc.

We consider the present somewhat demoralized condition only temporary. Inflation reached its limit and we now have swung to the opposite extreme. The next step will be into the conservative midway, where the stability of country-wide business will quickly assert itself. We look forward to continued prosperity on a safe and sane basis.

W. K. SIMPSON, *Secretary.*

Fulton Sylphon Co.

This has been one of the best years in the history of this company and there is no basic reason why business should not continue on the same satisfactory basis.

Raymond Concrete Pile Co.

We have the utmost confidence in the fundamental soundness of American business and in the judgment and resourcefulness of American executives as well as in the most wonderful national resources of the country and in consequence can only look forward to the continuation and growth of all sound enterprises.

HARRY R. MOYER,
Vice-President and Treasurer.

Kerner Incinerator Co.

We feel let up in residential building which country has been experiencing this year has been decidedly beneficial. Over built conditions are disappearing, and we look for a marked improvement in building starting in spring. From our standpoint fundamental conditions have never been more sound.

MACKAY WELLS, *President.*

Carter Bloxonend Flooring Co.

Believe stocks generally still much above actual value, too much money and credit is tied up in them. When market finally approximates normality for which it now seems headed, funds for real constructive work will be available and business will improve. Our observation is that it is generally good now.

David Luptons Sons Co.

Present stock market conditions should have little or no effect upon legitimate business. Sound values are not affected. We find no hesitancy in buying market or industrial building.

Truscon Steel Co.

We believe real estate and building situation will necessarily benefit by recent debacle. Losses have not been occasioned to substantial industries, nor have banking houses or investment institutions suffered. Undoubtedly these will gain tremendously at expense of speculating public. It is unlikely securities will appreciate as heretofore, making cheap money available and stimulating investment for building purposes. We have enjoyed the busiest year of our existence and even despite present market difficulties our volume is keeping up splendidly.

JULIUS KAHN, *President.*

Brownell Company

The country is in a more prosperous, safer and industrially sounder condition than it ever has been before and see no ground for uneasiness about fundamentals of prosperity.

J. R. BROWNELL, *President.*

Standard Conveyor Co.

Our barometer of future sales is the present amount of proposals or work on which we are figuring. There is more work in prospect for us right now than at any other time in our history. The increase or decrease in business that we may have is largely dependent upon our own individual efforts. We believe any decline or postponement which may result from recent stock activities will be temporary and slight.

H. L. DONAHOWER, *President.*

American Face Brick Assn.

Replying your wire 30th, building situation should be materially improved by lowered interest rates and more plentiful mortgage money which may now be reasonably expected. No general overbuilt condition exists and normal demand for new structures, coupled with desire for better housing, should soon bring renewed construction activity. Dissatisfaction with out-of-date homes and offices promises to result in increasing volume of both modernizing and new building, and may become very important factor in construction field.

GEORGE S. EATON, *Secretary.*

W. M. Ritter Lumber Co.

Answering your wire, industry generally, which of course includes the building industry, is fundamentally sound. The wild orgy of speculation on the stock markets is past. The vast sums of money that were diverted from legitimate business during the stock speculation period will find their way back into legitimate trade and industry and this must be extremely beneficial to the building industry. With the collapse of the stock boom an era of sanity will return. Men will regain their pose and be content to turn their minds and money into normal business channels. We view the future of the building industry from this time forward not only with confidence, but with genuine optimism.

W. M. RITTER,
Chairman of the Board.

Structural Gypsum Corp.

If we keep in mind that the recent stock market hysteria has produced a collapse of prices but not of sound values, there is no basis for a lack of confidence in the continued prosperity of the country's basic industries. On the contrary, money heretofore diverted into speculation should now begin to find its way back into and stimulate legitimate business. I feel that this will be especially reflected in the building industry, releasing many projects which for the past year have been held up through inability to finance except upon unsound basis.

G. LESTER WILLIAMS, *President.*

Atlas Portland Cement Co.

Answering your message the liquidation in stocks has in no way affected our confidence either in our own industry or in other sound enterprises. On the contrary, we believe that building and mortgages which at one time seemed unattractive will again come into their own. The fact that foreign cement is allowed to come into this country free, to compete with our higher costs owing to high labor, prevents my looking for a successful period in that particular line until the tariff question is remedied as we hope it will be.

JOHN R. MORRON, *President.*

Indiana Limestone Company

We believe the building industry shows good prospects for the coming year. With a large government program and state municipal railroads, banks and other corporations, building programs the largest in the history of the country. The slackness has been due to the falling off in smaller work such as small residences, apartments, etc., but feel that this work will improve on account of money being taken out of the stock speculative field and placed in good mortgage bonds. We have orders for a larger amount of fabricated work now than ever in the history of our business and are very optimistic for the future.

A. E. DICKINSON, *President.*

National Lead Co.

The reaction to the extreme speculation rampant both in the United States and Europe was logical and necessary and conforms to what any student of economic laws anticipated. The result should be a reduction of credits with corresponding decrease in current interest rates, which should be beneficial to the building industry.

EDWARD J. CORNISH, *President.*

Shevlin Carpenter & Clarke

My personal view is that the lumber industry and the building industry generally will, in the very near future, benefit by the liquidation of the stock market. Our lumber business began slowing down about six months ago, due largely to the fact that the capital of the country, to a great extent, was in demand at high rates to maintain fictitious stock market values. The result of this was curtailment of funds for building purposes and a sharp decline in building permits throughout the country. We are still under-built in the United States and it is evident already that capital will soon be available at reasonable rates for a building program. I look forward to 1930 with confidence.

E. L. CARPENTER, *President.*

Congoleum Nairn, Inc.

Answering telegram, we believe general business in this country fundamentally sound and look forward to continued good business in the future. Congoleum Nairn, Inc., volume and profits for each quarter this year has exceeded corresponding quarter last year. Stock values do bear a definite relationship to earning power, but this fact has been disregarded in a hysteria of inflation in some stocks which were bound to crash and temporarily carry all stock to a much lower level. The good ones will rebound to their true market value and the poor ones will have a hard time. Stock losses may temporarily affect business, but so long as business fundamentals remain sound and general business is guided by scientific budgetry and inventory control as is generally the case in the modern business in this country, I seriously doubt that progress and prosperity in the United States can be stopped. For the long pull the optimist in this country has always had the laugh on the pessimist.

HAWKES.

Richardson & Boynton Co.

The Institute of Boiler and Radiator Manufacturers feels that the fundamental condition of the country is sound and that the building industry may have its ups and downs, but that the increased population year in and year out leads us to believe that the building industry must continue to increase. We look forward with confidence to a good year in 1930 with the funds released from the market to be put into the construction of homes.

H. T. RICHARDSON, *President.*
Also *Chairman* The Institute of Boiler and Radiator Manufacturers.

Curtis Companies Incorporated

Liquidation in stock market has opened way to building of houses by releasing capital which will find its way back to mortgage market in good time in most communities. Surplus of houses is fast disappearing if not already converted into a shortage and with prospects distinctly good for lower money rates, I regard this as especially good time for commencing new house construction. With excellent reason expect that beginning next spring we shall have more active demand for building materials than since 1925. Recovery in security values yesterday indicates no lack of confidence in business situation which is, in my opinion, perfectly sound.

G. L. CURTIS, *President.*

The Casement Hardware Co.

As far as stock decline goes feel necessary corrective long overdue and that it will help legitimate business and construction industry although immediate effects may be adverse until situation is readjusted. Consider only one important factor now unsound —and that is government position in grains, which if maintained will cause the same inflation as in stocks with artificial barriers against natural corrective forces of supply and demand. Our company now enjoying largest and soundest business in its history and planning confidently on further progress next year.

C. E. SPENCER.

The American Rolling Mill Co.

Commerce and industry have made splendid progress during the past five years. They are still going strong and minus seasonal and other temporary fluctuations, they will always go strong. The steel industry has enjoyed an outstanding year without any inflation in price. Profit has been made from good volume and reduced cost. In this great and growing country with its boundless human and material resources industry must continue to grow steadily. Future business prospects and opportunities were never better than today.

GEORGE M. VERITY, *President.*

Bagues Inc.

Our business is perfectly sound and the prospects very encouraging.

President.

General Refrigeration Co.

Facts indicate a splendid soundness of the country from both business and financial standpoints. Business well ahead of last year and we believe will continue in goodly volume. Business in general already transacted this year to date places 1929 in the catagory of 1927 and 1928, which are conceded banner years. We have full confidence in the continuance of these good business conditions.

James R. Morash,
Vice-President.

Dahlstrom Metallic Door Co.

Most building projects of any magnitude already projected are too far advanced to be influenced by any purely temporary readjustments of the general public finances, therefore we are confident that the present stock market condition will have very little effect upon the larger building operations throughout the country such as those we are interested in. In fact, this experience may tend to turn the financial current into more creative channels and in the end serve a useful purpose.

H. E. V. Porter, *President.*

National Fire Proofing Co.

Your wire of even date has been received. Orders received would indicate that October will be a banner month for us thus far during the year. Present bookings carry us well into the first quarter of 1930.

The United States seems large and progressive enough to absorb shocks and dissipate them, serious though they may be for the time being.

S. F. Herbert, *President.*

National Lumber Mfrs. Assn.

All our information indicates that industry and trade are in an intrinsically sound position outside of the psychological effect of the stock market crash which of course is entirely conjectural. We are inclined to the belief that the return of the stock market to stability and reason will be good for the productive and construction industries which undoubtedly have suffered from excessive diversion of the nation's liquid capital to the stock market whether as loans or speculatively. We would not be surprised if the construction industry should improve on account of rather than despite the stock market debacle.

Wilson Compton,
Secretary and Manager.

Fiske & Company, Inc.

Our opinion is that the volume of building particularly of the better types will increase during nineteen thirty and that more money at reasonable rates of interest will be available for this purpose.

H. T. Folson, *President.*

Black & Decker

We are optimistic as we believe stock market situation will not adversely affect general business. General business is healthy, inventories low and money for business will be more plentiful, and most important of all more people will go to work and stop speculating.

S. D. Black, *President.*

Ambler Asbestos Shingle & Sheathing Company

There is nothing fundamentally wrong with the present business situation. A number of persons have sought to get money without rendering an equivalent for it and have guessed wrong to their own discomfiture. That is all.

Richard V. Mattison, M.D.,
President.

The Wheeler Osgood Co.

Developments of the past two weeks prompt us to look forward with confidence to marked improvement during next year in the building industry. We do recognize the tremendous producing capacity that has been built up and believe to secure fair returns on capital invested manufacturers of building materials must cooperate through trade associations to legally regulate production to demand.

W. E. Dunn Mfg. Co.

Ships like the building industry don't go down in seven squalls. Buyers will merely be more discriminating, seek better values. Right production methods with automatic machinery will lower manufacturing costs. This confidence in future makes us rush completion of new machine which will halve brick costs.

W. E. Dunn, *President.*

The Master Builders Co.

Stock market panic has not changed our views of business in United States of America. Survey shows fundamentally sound condition of our industry at this time. Prospects of easier money promise improvement in construction field ahead. Have every confidence in future.

S. W. Flesheim, *President.*

Wasmuth Endicott Co.

We look with complacency upon the prospects in the building industry. The panic in the stock market just receding will have little, if any influence upon the earning capacity of industry. Legitimate business will quickly resume its normal trend. Responsible builders will find money more plentiful for their operations and at lower rates, and the building program for next year should be very much larger than that of the past twelve months.

E. M. Wasmuth, *President.*

Dewalt Products Corporation

We have confidence in American ability and resourcefulness. Every crisis in past has been 90% hysteria. We are proceeding with our plant expansion plans affording greater facilities. We believe in continued prosperity and continuing advance of successful commerce. Our people have been educated to high standards of living in beautiful modern homes and industrial plants affording every convenience and will not be content to revert to pre-war status.

Paul Gardner, *President.*

Insulite Co.

The Insulite Company views the future with great confidence. We consider the business structure of country in splendid condition. People all over the earth are realizing the economic necessity for insulation. We are now preparing to build new mills at home and abroad to meet this rapidly growing demand. The building industry is prosperous and will continue its forward march.

Seymour W. Backus,
Vice-President

Acme Brick Company

Answering your telegram we believe present situation healthy and necessary, provided it brings an end to the era of recent years of inflation of securities and other abuses which necessarily follow such a period. We believe our business and other businesses of the nation will again prosper when the people get their minds off of profits from inflation of securities, and direct their energies toward their own productive efforts. We therefore view the present situation without fear and with the utmost confidence that good sense will prevail and that prosperity will reassert itself, based on hard work and clear thinking on the part of the American public.

W. R. Bennett, *President.*

Toch Brothers

In a business career of fifty years I have lived through three panics, in none of which have the businesses of this country been less affected than in the present one, which, to my mind, is just a localized storm particularly affecting those who wanted something for nothing. This panic is in a class of its own and has absolutely no bearing on merchants generally throughout the country, nor is it a money panic. Therefore, to my mind business will continue prosperously, as it has continued right along. Legitimate merchants, whether they be manufacturers, importers, or dealers, are being and will continue to be supplied with the necessary funds to conduct their businesses. There is no occasion for alarm or fear. Let every man make his own business his real business.

HENRY M. TOCH, *President.*

Federal Cement Tile Company

Dodge Corporation reports contracts awarded first nine months of 1929 equal to years 1925, 1926 and 1927. This is borne out in our own industry, where new production, shipment and erection records have been hung up. We will finish 1929 in full production and have a good start for 1930. The purchasing power in this country is so great that this, coupled with its increasing export trade, will carry it on an even keel indefinitely.

I. H. FREUND, *President.*

Cellized Oak Flooring, Inc.

We anticipate decided increase in building construction as a result of stock market fiasco, as much needed construction will now go ahead due to expected diversion of funds from call money to savings accounts and building construction. Our sales force now particularly enthusiastic about near future possibilities in our line.

A. O. CUTHBERT, *General Mgr.*

Portland Cement Association

The construction industry finds no cause for alarm in the recent market crisis, because of the ample stocks of high grade materials available at fair prices and with money both plentiful and cheap. Contractors are in excellent position to capitalize their skill and to profit from well planned merchandising. The opportunities inherent in winter construction should be recognized with results certain to be beneficial to every phase of building industry from architecture to labor.

WM. M. KINNEY, *General Mgr.*

Speakman Company

In view of the present situation it is hard to make any statements with confidence that might be borne out by later events. Views I have gathered the last day or two, however, show that eventually money would be released, which would later go into the financing of the building industries. I hope this is true. If this is the case, next year, at least, should promise some fair business.

WILLIAM A. SPEAKMAN, *President.*

The Eagle Picher Lead Co.

For some time the one weak spot has been the stock market. It has been a hindrance to business in many ways. High money rates have retarded building operations. While the cure has been painful, there is no doubt we are on a firmer foundation. It is possible the volume of new buildings may be lower for a time, but this can be offset if we can better sell the American people on the value of improving and modernizing their homes and properties. If this is done in a systematic way it will be possible to lift the building industry to higher levels than ever.

A. E. BENDELARI, *President.*

James B. Clow Co.

That the country has safely passed through the present crisis is the best evidence of its soundness and indicates that the future holds even greater rewards for those who have confidence. The building industry should eventually prosper as a result of this shakedown indicating as it does that for security one must be satisfied to grow with the country and receive only a reasonable return on investment.

WM. E. CLOW, *President.*

Concrete Steel Company

It is my firm belief that a readjustment in the stock market, such as has taken place during the past month, will eventually materially benefit the building industry. There is no doubt but that the capital of the country has been attracted to Wall Street by the lure of quick profits.

Since the recent demonstration of how insecure such profits have been, capital now will seek real investment channels instead of speculation. The eradication of the gambling mania which has recently taken hold of the public will undoubtedly help general business and especially the building industry. Therefore, I believe those in the building trade can look forward to a resumption of normal business during the coming year.

W. H. POUCH, *President.*

American Institute of Steel Construction, Inc.

Structural steel during 1929 has been selling in a volume greater than for last year, although the total of all construction has declined.

From information that comes to us we anticipate an even greater volume of steel construction during 1930. Much of this work has been held in abeyance by the drainage of money from outlying communities to Wall Street. The speculative deflection has been salutory to business. We believe that it will be a decided benefit to the structural steel industry as we can now go ahead on projects, the financing of which has heretofore been delayed.

CHARLES F. ABBOTT,
Executive Director.

Kawneer Co.

Our volume is above normal for this season, we expect the usual amount of business during the fall and winter. Stock market fluctuation has not as yet been a vital factor in our industry. However, millions now released should be available not only for us, but for the building industry in general. We are optimistic as to future activities. We are makers of metal store fronts, doors, windows and mouldings.

FRANCIS J. PLYM, *President.*

The Frink Corporation

Based upon our judgment of the outlook in the lines of business with which we come in contact, we consider the recent severe shrinkage in values of securities throughout the country to be very excessive, largely unwarranted and not as correctly indicating the future course of such businesses. These businesses seem to us to be in sound condition and we believe that they will continue for some time to be profitable to companies properly operating in such lines.

J. A. C. JENSEN, *President.*

Frederic Blank & Co.

We believe the readjustment of the market will have a salutary effect in the building trades. Funds formerly engaged in speculative ventures are being released for sound investment, with the result that building will profit. We look to the future with optimism.

Schlage Lock Co.

Our business in excellent shape with market widening steadily, and we look forward to a most prosperous future.

CHARLES KENDRICK, *President.*

The McAlear Mfg. Co.

Do not believe general business will be greatly affected by hysteria in stock market. The country is in a sound economic condition which undoubtedly will continue now that the stock values are brought to a more sound basis. I am of the opinion that the flurry in the stocks will be a means of diverting capital to building and other lines of industry, which in turn will create more employment and a greater measure of prosperity than we have had for some time.

JAMES MCALEAR.

Herman Nelson Corp.

We view present situation as a natural readjustment of existing inequalities, due to great prosperity period. Can see nothing fundamentally wrong and believe this readjustment was not only inevitable, but will soon improve conditions in certain fields, one of them being the building industry.

HERMAN W. NELSON, *President.*

Warren Webster & Company

Our business is better this year than it was last year and continues to show the same steady progress that it has shown every year since the war period. Orders and shipments are at a new high point despite some reduction in the volume of new construction. We attribute this to constant improvement in product and maintenance of quality. We see no reason why progressive companies in the building material field, who continue to improve their product and to maintain quality, should not continue to do business in increasing volume.

HAROLD F. MARSHALL,
Asst. Sales Manager.

Sarco Company, Inc.

From a study of our own business and a knowledge of the plans and development work of our customers, we are convinced that the basic conditions of trade are sound. If there should be a panic or any serious regression in trade, we believe same will be wholly without warrant. Prices appear to be stable, demand substantial, and profit is satisfactory.

CLEMENT WELLS, *President.*

Timeostat Controls Co.

The outlook for business for the balance of this year seems excellent indeed. We base this upon the fact that our shipments for October of this year were 70% in excess of our shipments for the same month of last year. What is more important is the fact that incoming orders for the last half of October were 100% greater than the incoming orders for the same period of 1928.

JULIUS K. LUTHE, *President.*

Henry Klein and Company, Inc.

We believe that the recent liquidation and adjustment in the securities market can only have a beneficial effect on business generally. It is our further belief that it will result in a noticeable increase in building construction. In fact, we consider that our prospects for increasing business have never been greater.

Celotex Corp.

As I see the situation general business outlook is bright. I believe recent market correction was not only needed to save speculators from themselves, but will prove a beneficial effect on general business if it does what it should do and that is, take the money and time of the people out of crazy speculative channels and divert them into orderly investment items. Building business has been a little slow not by reason of absence of needs or disinclination of people to build more houses and other structures, but by reason of their being unable to compete with crazy interest rates occasioned by New York call money market. With money rates normal I look for very substantial resumption of building activities. So far as our own business is concerned we are going considerably ahead of last year. Some weeks ago I was somewhat apprehensive on business future because of fear that stock market fiasco might seriously affect underlying conditions, but now that needed correction has taken place without any serious disturbance to underlying fundamentals, I am extremely optimistic over the future.

B. G. DAHLBERG, *President.*

Mueller Co.

We are not alarmed by present conditions and do not anticipate any radical change that will have a depressing or decreasing influence on our volume. Our output at present is up to our average seasonal shipments and the demand continues good. We anticipate a continuance of the present demand and look for a stable business for the remainder of the year.

ADOLPH MUELLER.

Aerofin Corp.

The building industry is so fundamental that after the first shock of the market decline is over the sound value of the building industry will attract the investor. The industry can therefore view the future with confidence and prepare to come into its own. We are increasing our facilities.

Fitzgibbons Boiler Co., Inc.

We regard general evidences and conditions as promising continued good business and sustained activity in industry. Adequate money and normal population increases in its demands and feel no cause for change in our business and manufacturing plans, or any alarm about building, etc., for coming six months.

Libbey Owens Glass Co.

We look for healthy activity in sound investments, including building projects. Believe unstable situation in recent past has been corrected and that more stable conditions will develop.

J. C. BLAIR, *President.*

E. B. Badger & Sons Co.

We have no fear that situation which existed in stock market last week will have any permanent effect on the sound industrial conditions which exist today.

E. B. BADGER, *Treasurer.*

Kalman Steel Comany

I have every confidence in the future of the building industry and feel that the prospects are that money conditions will be very much easier for the balance of this year and for the year 1930. This undoubtedly will be of great assistance to the entire building industry, and many prospects that have been held up by money conditions should now go ahead.

PAUL J. KALMAN.

Quiet May Automatic Oil Burner

I see no reason why the stampede of embryonic, or too venturesome stock speculators should influence the progress of the building industry, or of business in general, except to have a much needed stabilizing effect. The market decline of the past few days should send many qualified workers back to less exciting, but more productive effort, and its reaction is assurance of a general financial stability. I believe the circumstance will have a chastening financial effect and that building operations and business development that have been held back this year because of high money, can be assured of ample funds in 1930.

EDWIN M. FLEISCHMANN, *President.*

Kosmos Portland Cement Co.

In reply to your telegram, it seems certain that, in time, building will be helped by the return of the country's funds to legitimate uses. For a while, however, I think widespread individual losses will check all forms of consumption, including building.

CHARLES HORNER, *President.*

Taco Heaters, Incorporated

Our buisness is the best it has ever been, and we see no reason why present stock market activities should affect the consumption of our product in homes scattered throughout the country. We certainly will not modify our plans for next year due to any doubt as to the future.

ELWOOD S. WHITE, *President*

Josam Mfg. Co.

We feel confident the financial situation will right itself if the country's leaders and institutions in the financial, commercial and industrial fields go ahead about their business, and form an optimistic viewpoint based on their conditions and requirements, as the basic business structure in our field is fundamentally sound. Our company is ging ahead with contemplated expansion based on our actual requirements. Cooperation of all is necessary.

JOSEPH HIRSCHSTEIN, *President.*

Reading Iron Company

We have advised all our district sales offices that the situation created by the crash in values on the New York Stock Exchange is serious is not to be questioned. It is impossible to squeeze billions of dollars out of credit values of this country without there being a serious reflex, but there is nothing in the situation as it has developed thus far to entitle anybody to view future with pessimistic feelings. For the first time the Federal Reserve banking system is thoroughly tested in a financial situation closely resembling a panic. That the Reserve Bank system has stood the test most admirably and far beyond our expectations is demonstrated effectively and instead of a disaster of magnitude, we have merely a reduction in values and small losses to those who are dealing in margins. Neither brokerage houses or banking houses have as yet suffered, and we doubt if they will because the credit situation in all banks is liquid. Speaking generally the earning capacity of corporations is as yet unimpaired. There is plenty of money for commercial credit, and initiative need not be stayed because of lack of funds. We expect the building situation to improve in 1930 for the reason that funds heretofore not available will find profitable investment in new buildings. It is possible that some lines of industry may be affected, and it is quite probable that the resale merchants will find the Christmas season rather disappointing, but in general the situation does not impress us as one calling for retrenchment, or even for a gloomy view.

P. N. GUTHRIE, JR., *Vice-President*

Electrol, Inc.

Have just closed the greatest October in Electrol's history. Believe it was also the largest October in history of the oil burning industry. With hard work we can see nothing but progress ahead.

LEOD D. BECKER, *President*

The Davey Tree Expert Co.

In my judgment the best thing that could happen for general business and the building industry was the deflation in the stock market and the elimination of the wholly unwarranted artificial values. All of the nation's wealth is still here. None of the money or the wealth has been destroyed. People should now give more attention to business and seek the safer investments. This should stimulate building and all forms of good real estate investment. It should help general business. There may be a temporarily adverse effect for psychological reasons but in a short time business should move forward with renewed confidence and vigor. Fundamental conditions are sound and the real causes of prosperity are still with us in positive form. Our business program is going forward with the usual confidence and aggressiveness.

MARTIN L. DAVEY, *President*

Alberene Stone Co.

We look forward with greater confidence than ever before.

J. L. KRETZMER, *Vice-President*

Otis Elevator Co.

We view the present situation with absolute confidence and are expecting an increased volume of business in 1930.

W. D. BALDWIN, *Chairman.*

Best Bros. Keene Cement Co.

While orders have fallen off since first heavy drop in stock prices, consider basic industrial conditions sound and see no reason to view future other than with confidence.

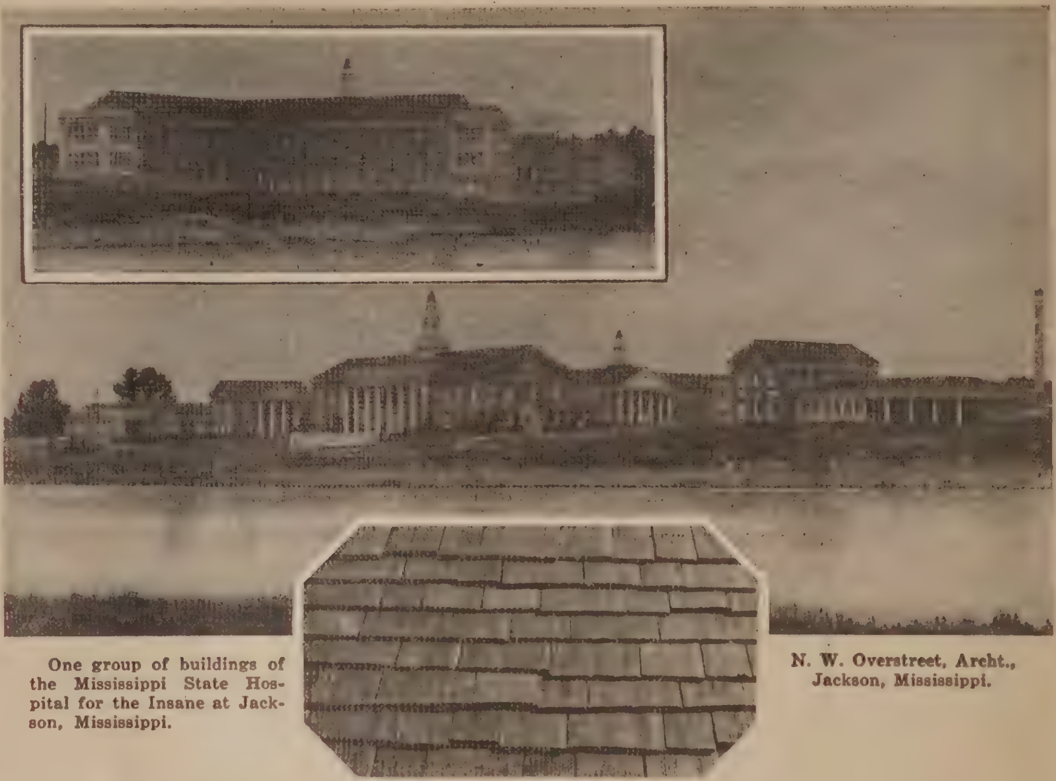
JOHN C. BEST, *President.*

THE
ARCHITECTURAL
FORUM

IN TWO PARTS

PART ONE
ARCHITECTURAL DESIGN
DECEMBER
1929

HOTEL REFERENCE NUMBER
PRICE $3



One group of buildings of the Mississippi State Hospital for the Insane at Jackson, Mississippi.

N. W. Overstreet, Archt., Jackson, Mississippi.

Devonshire English Shingle

ROUGH TEXTURE

> In the single state of Mississippi, during the past three years, over forty educational and institutional buildings have been erected in Jackson, Cleveland, Columbus, Ellisville, Oxford and Starkville, for which 184 carloads of Hood roofing tiles of various types have been furnished.

Architects and designers of the modern institutional building are rapidly appreciating the opportunity for fuller expression through the use of roofing tile in creating not only permanent protection but also greater beauty through more plastic color treatment.

Hood Roofing Tiles in their wide variety of natural pleasing colors, present the solution to any desired color scheme or authentic architectural design from the simplest to the most formal.

Address Department "F", Daisy, Tennessee.

B. Mifflin Hood Company

KIL-KRAFT TILES
TRADE MARK
DAISY, TENNESSEE

Above all things use Hood Roofing Tile

THE ARCHITECTURAL FORUM

Published Monthly by National Building Publications Division of National Trade Journals, Inc., 521 Fifth Avenue, New York, N. Y. Yearly Subscription: U. S. A. Insular Possessions and Cuba, $7.00. Canada, $8.00. Foreign Countries in the Postal Union, $9.00. Single copies: Quarterly Reference Numbers, $3.00; Regular Issues, $1.00. Entered as Second Class Mail Matter at the Post Office, New York, N. Y., under the Act of March 3, 1879.

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VOLUME LI
Number 6

THIS flowing color design changing from a dark brown into white at the top is worked out with various shades of Hanley Glazed Brick—a self cleaning product that retains its color.

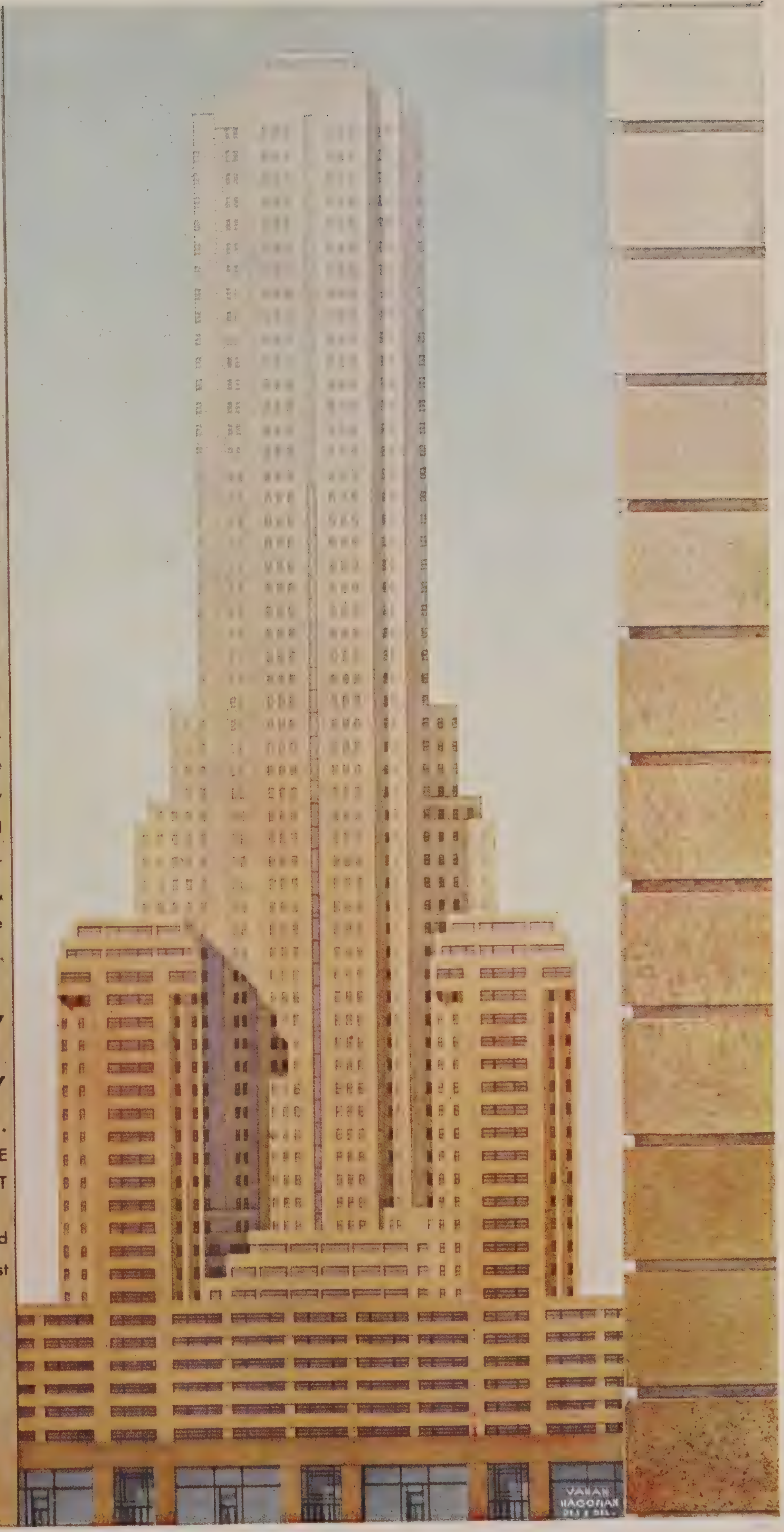
The color changes are imperceptible from floor to floor. Because of the method we have worked out the changing effect is perfectly practicable, specific colors being shipped labelled for certain floors. This flowing effect can be achieved in the glazed colors of blue or brown running from the deepest into the lightest shades.

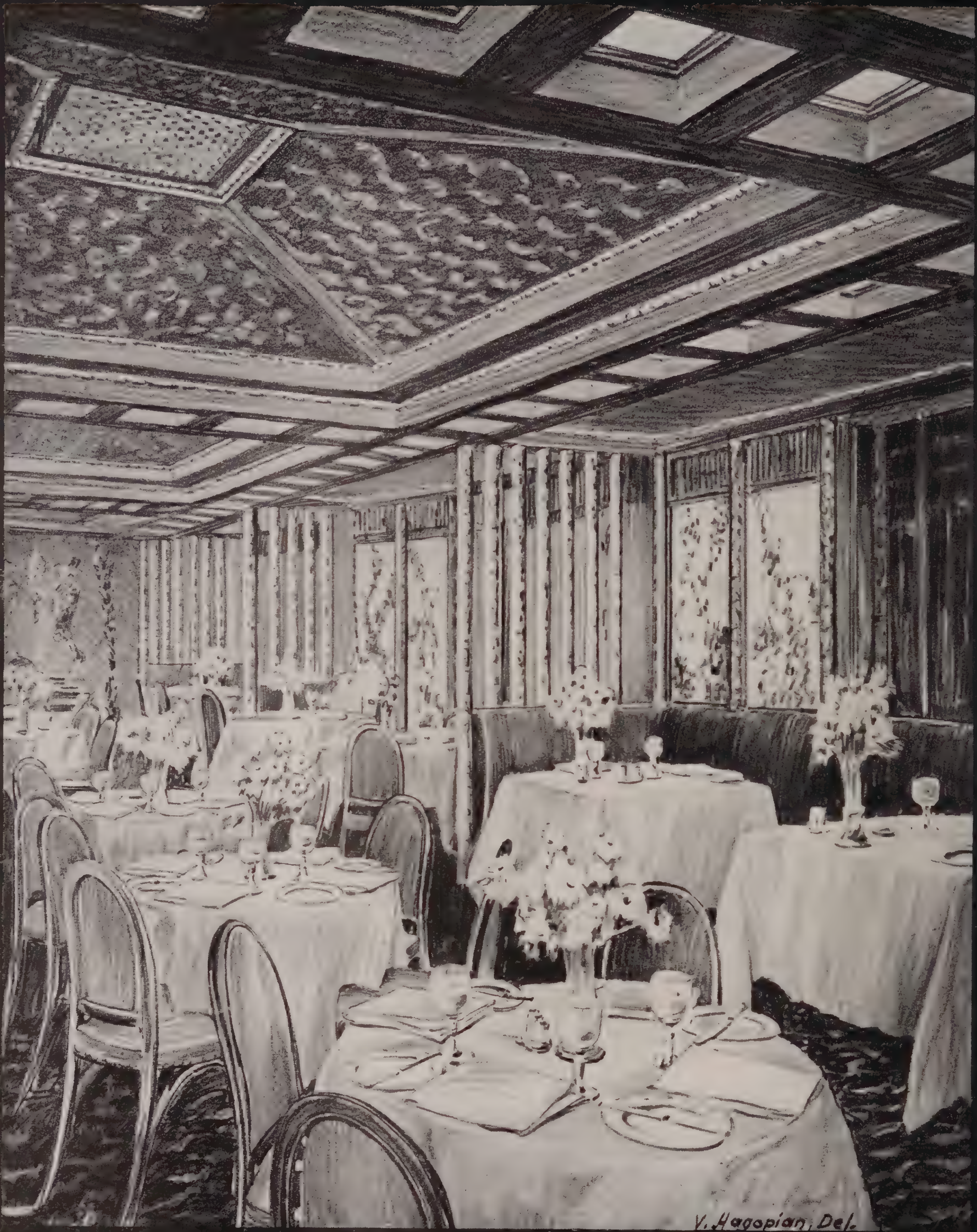
Attention is called to the modern effect of the design, which we believe presents a new and interesting thought in skyscraper construction. The normal horizontal lines of the street are accentuated for a few stories and gradually diminished and changed into the natural vertical effect of a tall building, thus eliminating the abrupt change from the horizontal to the vertical.

HANLEY COMPANY
BRADFORD PENN.
NEW YORK · 565 FIFTH AVENUE
BOSTON · 260 TREMONT STREET

. . . . Largest Manufacturers and Distributors of Face Brick in the East

Established 1893




V. Hagopian, Del.

In the Sea Glades of the Hotel St. Regis, New York City, designed by Joseph Urban, Frink illumination has been made part of the decoration.

THE FRINK CORPORATION
369 LEXINGTON AVE., NEW YORK
Branches in Principal Cities

Plate No. 13

Complete folio of these drawings sent on request

Specify LEAD

for paint satisfaction

When lead paint goes on a wall, it goes on to stay, to give lasting satisfaction.

For exterior use, lead paint stands all kinds of wear and weather. It is tough and elastic. For interior use it produces beautiful, lasting finishes, either plain or modern plastic treatment.

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Reg. U S. Pat. Off.

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THE HOTEL GOVERNOR CLINTON, New York City
Murgatroyd & Ogden, Architects

SARGENT HARDWARE...

to help assure a hearty welcome

HOSPITALITY and excellent service may be found in the Hotel Governor Clinton. No efforts have been spared to provide its guests with unequaled comforts and conveniences. Its construction is massive, strong and time-defying. Its trim and decoration are modern yet tastefully restrained.

Throughout this very modern hotel the hardware equipment is Sargent. Maximum security and utmost convenience are assured to every guest. The management can count on the best possible protection. Of solid brass or bronze, precisely machined, this excellent Sargent Hardware will contribute its share towards the lasting usefulness of this outstanding structure. Sargent & Company, New Haven, Connecticut; 94 Centre Street, New York City; 150 North Wacker Drive (at Randolph), Chicago, Illinois.

SARGENT
LOCKS AND HARDWARE

More Proof of the Swing to Indiana Limestone

Willoughby Tower, Chicago, Ill. S. N. Crowen & Associates, Architects. Dilks Construction Co., Builders. Built of Variegated Indiana Limestone.

THE Willoughby Tower on Michigan Boulevard, Chicago, is one of the most recent proofs of the way Indiana Limestone now predominates in the newer architecture of our leading cities. In New York, in Chicago, on the Pacific Coast, in the north and south, no matter where you look, there is not a city without one or more outstanding buildings faced with this beautiful light-colored natural stone.

Talk to anyone connected with these projects and the story is the same; the public preference for the beauty of natural stone makes it advisable to use Indiana Limestone facing. This stone from southern Indiana gives a building an appeal that shows a definite dollars-and-cents return in income. The low upkeep expense and permanence of Indiana Limestone are added factors which with easier rentability make the use of this stone desirable.

Indiana Limestone is now produced in such huge volume by this company that it can be laid down anywhere at prices which compare favorably with the prices of less desirable materials. Why not specify Indiana Limestone for the new projects which you are designing? There is a representative in your vicinity who will gladly answer your questions. May he call? For literature or other information, please write Box 766, Service Bureau, Bedford, Indiana.

INDIANA LIMESTONE COMPANY

General Offices: Bedford, Indiana

Executive Offices: Tribune Tower, Chicago

A *concrete* roof on the same steel originally designed for lighter material!

Featherweight Concrete
INSULATING ROOF SLABS

THE Globe Steel Tubes Company of Milwaukee found it necessary to use a very light construction for this particular building, and designed the structural steel roof framing accordingly.

When they heard of *Featherweight Concrete*, however, there was an immediate preference for it because of previous experience with the permanent, fireproof, no-maintenance service of Federal Roofs.

A check-up of the steel, both by the fabricators and our own engineers, disclosed that the design was entirely adequate for *Featherweight Concrete*—even though laid out originally for a less substantial roof material.

This light weight is but one of the many factors that have contributed to the instant success of *Featherweight Concrete Slabs. Over 2,500,000 square feet have already been purchased*—by concerns like Inland Steel, International Harvester, Chicago, Milwaukee & St. Paul R. R., Bendix Aviation, and for the new Detroit Airport Hangar, the 124th Artillery and Naval Armories at Chicago, Auditoriums at Shreveport and Flint—and many more buildings. *New "Catalog and Roof Standards" now available on request.*

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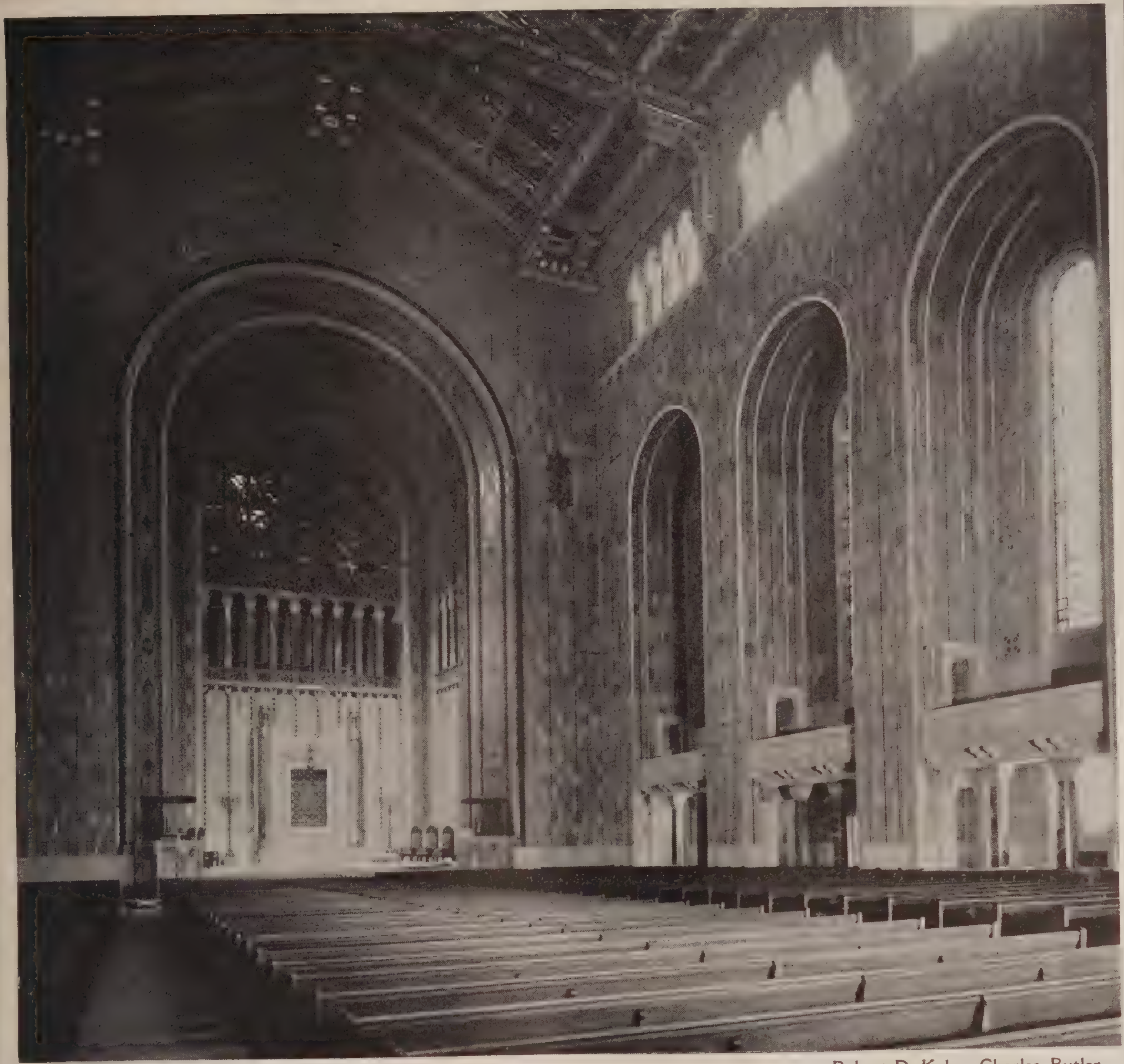
FEDERAL CEMENT TILE COMPANY
608 South Dearborn Street - - Chicago
FOR OVER A QUARTER CENTURY



Temple Emanu-El
5th Avenue & 65th Street
New York, N. Y.

Robert D. Kohn, Charles Butler
& Clarence S. Stein, Architects.
Mayers, Murray & Phillip,
Associate Architects.

AN AKOUSTOLITH INSTALLATION

Side wall installation of AKOUSTOLITH sound absorbing artificial stone in a gradation of color from light at the base to dark at the ceiling and with gold ceramic inserts.

R. Guastavino Company

40 COURT STREET, BOSTON, MASS.
225 WEST 34TH STREET, NEW YORK, N. Y.

R. GUASTAVINO CO. OF CANADA, Ltd.
New Birks Building, Montreal, P. Q.

A Garage is essential to complete hotel service

Chalfonte-Haddon Hall at Atlantic City rejoices not alone in Messrs. Leeds & Northrop's magnificent new Haddon Hall but in the great parking service afforded by the adjoining d'Humy Motoramp Garage, from designs by Rankin & Kellogg, Architects. It shows in the immediate foreground.

They're relative in size and importance...

a patron's motor car, his hand luggage and the necessity of your planning facilities for handling them

THE Hotel whose plans take shape on your boards today needs must consider its patrons' motor cars. They must be received, stored and safeguarded as a service undertaken with full responsibility. Nothing less than a hotel owned or hotel-participating garage permits a check on the service rendered.

Where hotels of past and present origin content themselves with an annexed or adjacent garage, the hotel of tomorrow will follow the precedent of the office building of today. It will be a Combination Building—hotel and garage under one roof! The same considerations apply whether the project be one which contemplates transient or resident patronage.

That it will be a d'Humy Motoramp Garage follows a fundamental economic law. Through ten years development, and in the building of 250 buildings, no generally comparable efficiency of layout or economy of operation has established itself.

You know that this company's engineers stand ready to give you the benefit of their years of experience, in shaping up the preliminaries of a garage—without cost or obligation. For the later full engineering service and use of d'Humy patents a charge is made to the owner as an item of building investment.

RAMP BUILDINGS CORPORATION

Garage Engineers

21 East 40th Street New York, N.Y.

Licensors of d'Humy Motoramp patents for garages aggregating an investment value in excess of $100,000,000.

Razor-edges and Snowflakes

Man-made objects lose with magnification; nature's productions show up still better. The keenest razor-edge looks coarse and ragged under the microscope, but the more you magnify a snowflake the more beautiful it becomes.

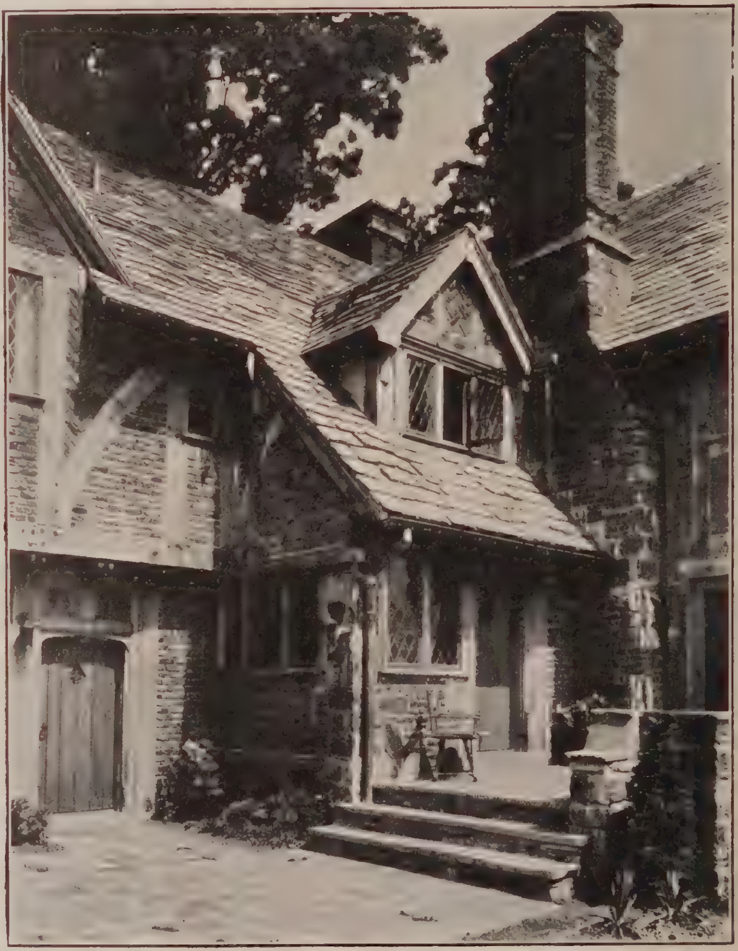
Sheldon's slate is nature's product. No artificiality appears, no matter how close you come. Like the snowflake, it can stand the microscope, so to speak.

That's why this corner of that peaceful residence we showed you last month: a close-up in which nature's beauty is enhanced.

Which leads us to reflect that a Sheldon slate roof is "a roof of eternal beauty," whether viewed from afar or from nearby.

To refresh your memory, this peaceful nook occurs in the residence of George G. Sicard, Larchmont, New York.

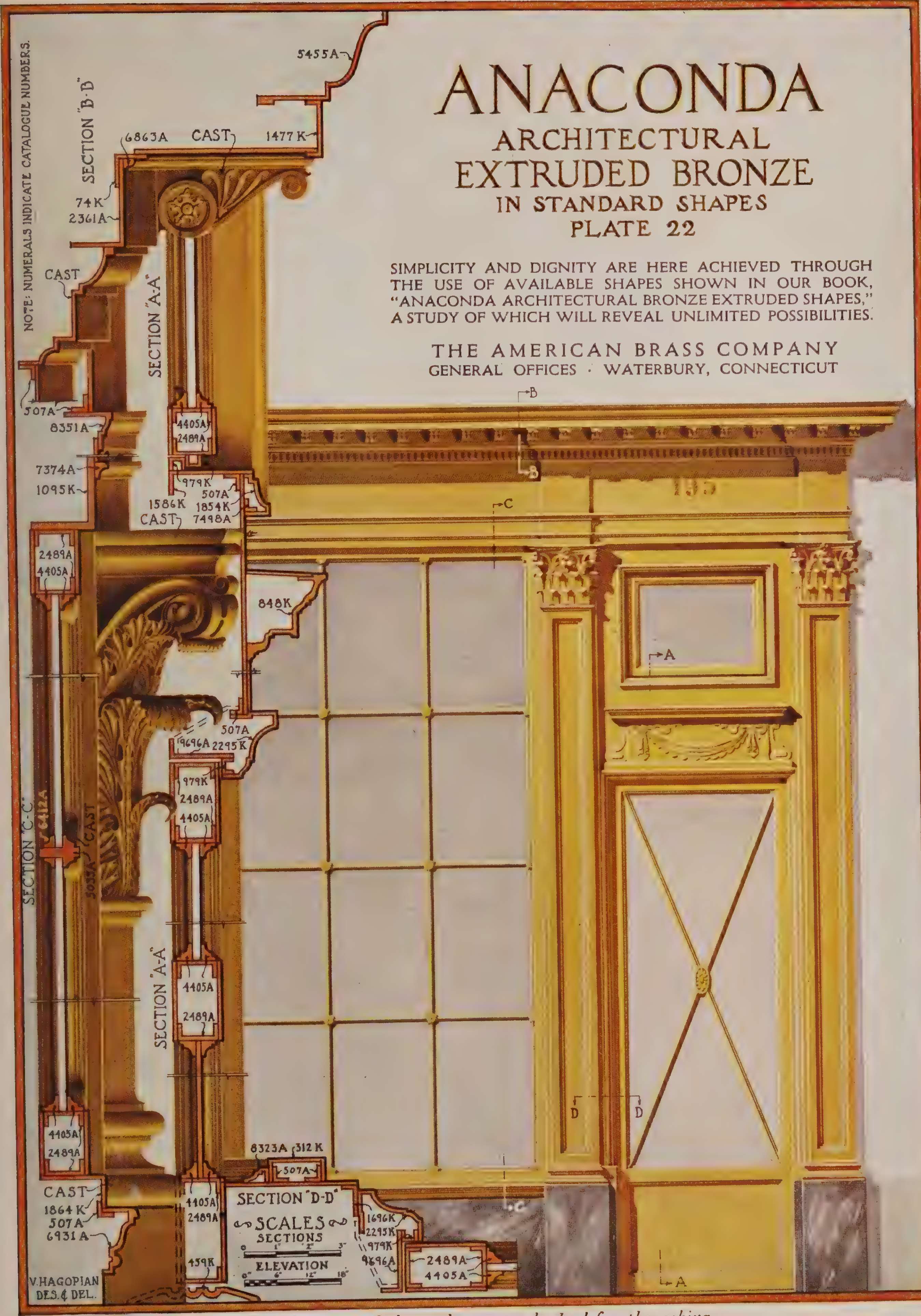
John Russell Pope, Architect.



F.C. SHELDON SLATE CO.

GENERAL OFFICES · GRANVILLE · N · Y ·

· BRANCHES IN PRINCIPAL CITIES ·



ANACONDA
ARCHITECTURAL
EXTRUDED BRONZE
IN STANDARD SHAPES
PLATE 22

SIMPLICITY AND DIGNITY ARE HERE ACHIEVED THROUGH THE USE OF AVAILABLE SHAPES SHOWN IN OUR BOOK, "ANACONDA ARCHITECTURAL BRONZE EXTRUDED SHAPES," A STUDY OF WHICH WILL REVEAL UNLIMITED POSSIBILITIES.

THE AMERICAN BRASS COMPANY
GENERAL OFFICES · WATERBURY, CONNECTICUT

Complete sets of these plates may be had for the asking

Your reputation often depends upon a "trifle" . . .

In the cost of constructing a building, hardware is a trifle. If it is suitable, strong and silent, the layman public never notice it. But let it fail to function, let it rust or break or balk, and owners are up in arms.

The public judges your professional ability, whether fairly or unfairly, not only by the design of a building but by the contractor's fulfillment of his part of the work, for which you are indirectly responsible.

It stands to reason therefore that you should not willingly allow a contractor to erect a structure any detail of which will reflect upon your professional ability. The standard clause which states that "all workmanship is subject to approval or condemnation by the architect" is always pointed out triumphantly by the layman.

Protect yourself. The specification of good hardware instead of cheap hardware adds but a trifle to the total cost of a building—but your reputation often depends upon it.

P. & F. CORBIN SINCE 1849 NEW BRITAIN CONNECTICUT
The American Hardware Corp., Successor
New York Chicago Philadelphia

Good Buildings Deserve Good Hardware

33 Stories of Good Hardware—Corbin

The new Kopper Building in Pittsburgh. Architects—Graham, Anderson, Probst & White, Chicago. Associate Architect—E. P. Mellon, New York City. General Contractors—Mellon-Steward Co., Pittsburgh. Equipped complete with Good Hardware–Corbin, including Corbin Unit Locks (Camden Design, special H. B. finish) and Corbin Door Checks (with key adjustment).

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Design—Construction

Management

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CENTURIES OLD

The First Day They Are Laid

A Cottage at Chedworth, Glos

TIME, the master painter, has etched his delicate colors into the tile of England's roofs. But here is a tile, fresh from the kiln, that faultless artistry has given all the mellow charm of age---the softened broken lines, the warmth, the soothing tones, the very warp and twist that mark Old England's tile---even the gentle modulated coloring that comes with generations of exposure to the weather.

If you would have a roof of genuine aged appearance, by all means allow us to send you samples of HEINZ PLYMOUTH SHINGLES. They are faithful in every detail to the time-weathered tiles of the Old World.

THE HEINZ ROOFING TILE CO.

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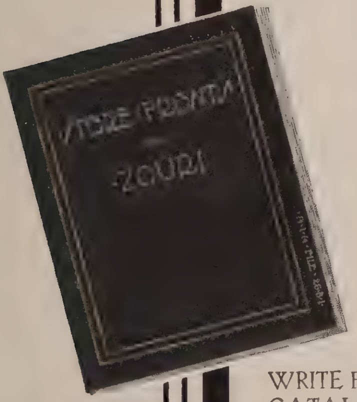
EXTRUDED BRONZE
CHROMIUM PLATE

Electrolytic Finishes
Bronze Doors and Windows
Licensed Chromium Equipment



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ZOURI COMPANY OF CALIFORNIA
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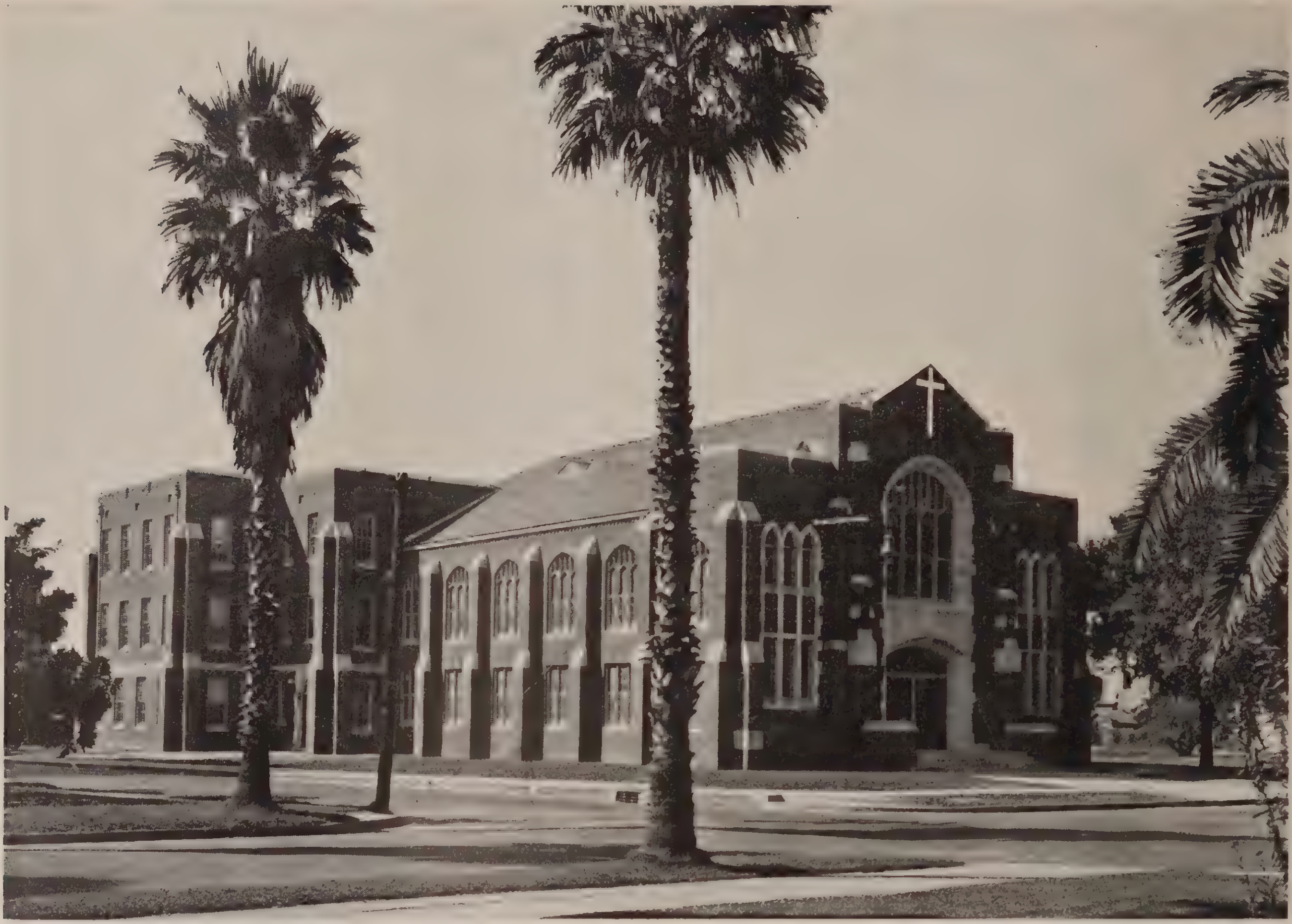


BROAD STREET METHODIST CHURCH, LAKE CHARLES, LA.

ASMUS, CLARK *and* MCCOOK, *Architects*

P. OLIVIER & SON, *General Contractors*

It is faced with a special blend of Acme Brick from our Denton Kilns

Colorful Charm for Church Walls

Through the Medium of ACME BRICK

America's outstanding church buildings rendered in Face Brick are a tribute to this material as a medium for permanent and colorful walls. Acme Face Brick—in their wide variety of blendings and textures—afford unlimited possibilities for the exteriors of churches of every architectural type.

This splendid structure is faced with soft restful colors of blended tans, rich russets, nut browns, down through the golden bronze and gunmetal tones. Let us help you solve your color problems—ten Acme owned-and-operated plants and 38 years in the art of brickmaking enable us to serve every architectural need.

ACME BRICK

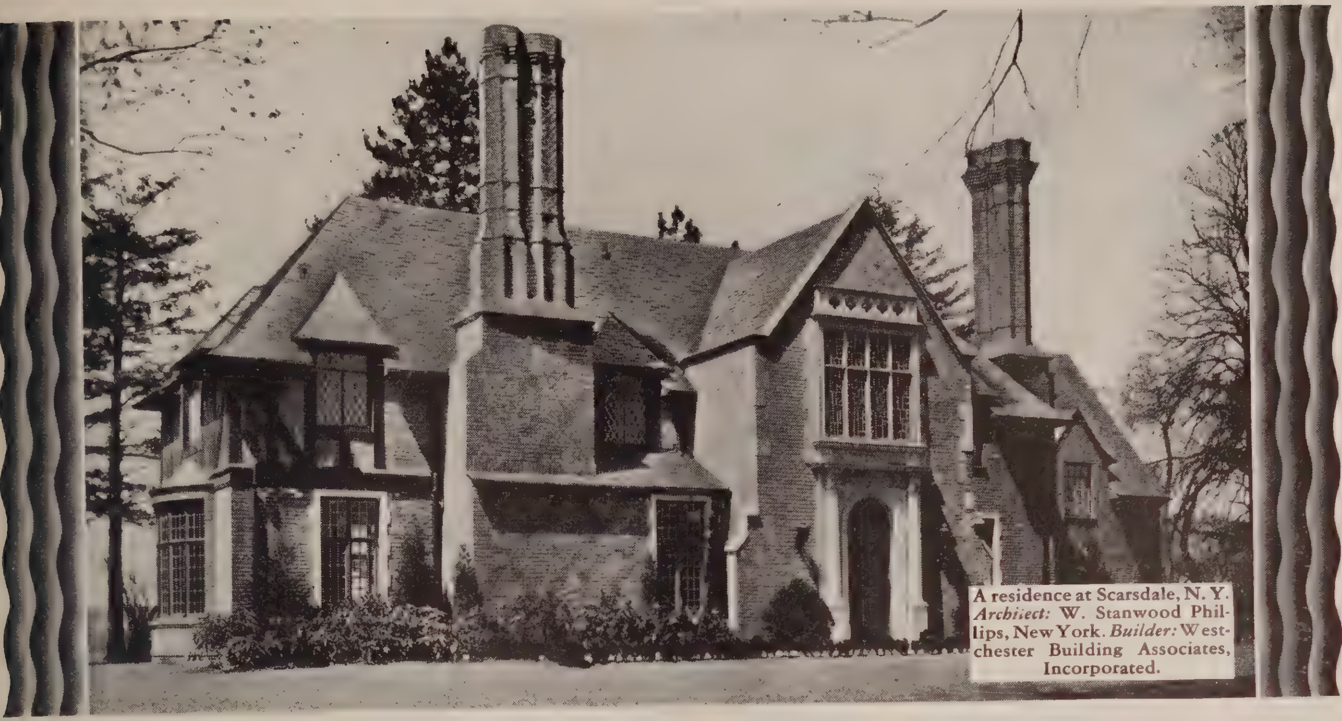
ACME BRICK CO. *Established 1891*

General Offices, FORT WORTH, TEXAS

Manufacturers of the Products We Sell. 150,000,000 Face Brick Capacity Per Year

PLANTS, OFFICES, DISPLAYS AND DEALERS THROUGHOUT THE SOUTH AND SOUTHWEST

BUILD FOR THE CENTURIES WITH ACME BRICK



A residence at Scarsdale, N. Y. *Architect:* W. Stanwood Phillips, New York. *Builder:* Westchester Building Associates, Incorporated.

Through the office of

W. STANWOOD PHILLIPS

Fenestra Casements

were used in this beautiful Scarsdale house

With its attractive bays, dormers and oriels, its stately chimneys, its rugged roof and its mottled brick walls, this house is a distinguished expression of English motifs. And like the prototypes of an earlier day, much of its beauty is due to the casement-type windows with their small sparkling panes.

Not alone because of the inherent beauty of Fenestra Casements but also because of their *modern comforts and conveniences,* these better steel windows are being specified by American architects:

Weather protection, due to proper design and accurate workmanship, better ventilation—100% opening if desired; easy washing, made possible by modern extension hinges; fly-tightness, an advantage of the new Fenestra Screen Casement in which the steel casement and the metal screen are made to operate together—both furnished by one manufacturer; and finally low cost, a result of quantity production in a large variety of types and sizes.

New literature covering Fenestra Screen Casements will be gladly sent upon request. The complete Fenestra Blue Book will be found in your copy of Sweet's Architectural Catalogue.

DETROIT STEEL PRODUCTS COMPANY
2284 East Grand Boulevard, Detroit, Michigan
Factories: Detroit, Michigan, and Oakland, Calif.
Convenient Warehouse Stocks

Fenestra SCREEN CASEMENTS

Concrete Masonry Construction Makes Fine Homes Firesafe

IT IS easy to understand why an ever-increasing number of fine homes are being built with concrete masonry walls and concrete floors. This type of construction not only assures utmost durability and strength, but—of even greater importance to the owner of every fine home—*Firesafety!*

Here is complete protection for your investment in the home itself, and its furnishings. Rare libraries that can never be replaced, costly rugs and tapestries, prized trophies and mementos of earlier years—for the loss of these no insurance can adequately compensate. They must be *safeguarded* from fire.

Then, too, there's the peace of mind which firesafety creates—entire freedom from anxiety. Fires that originate in the basement—and many of them do—are completely isolated from living quarters by a concrete first floor. Loved ones are assured utmost protection.

Another feature of this modern construction is its resistance to extremes of heat and cold. A concrete masonry wall (built of *hollow* concrete units) is virtually *two* walls, with insulating air space between outer and inner surfaces. Homes thus protected may be kept delightfully cool on summer's hottest days. With a smaller expenditure for fuel than is customary, they may be kept comfortably cozy in the zero cold of winter.

Residence of Col. Edwin S. George, Bloomfield Hills (Detroit), Michigan. Geo. D. Mason & Co., Detroit, Architects. I. J. Isgrigg, Pontiac, Michigan, Builders.

Another view of the Col. George home. Walls are largely of concrete masonry. Exterior is of portland cement stucco, brick, and stone trim. With reinforced concrete floors throughout, this residence is as nearly firesafe as it can be built. It replaces one destroyed by fire.

PORTLAND CEMENT

CONCRETE FOR PERMANENCE

Residence of P. D. Houston, Bellemeade (Nashville), Tennessee. Biglow & Henthorn, Architects. Rock City Construction Co., Builders.

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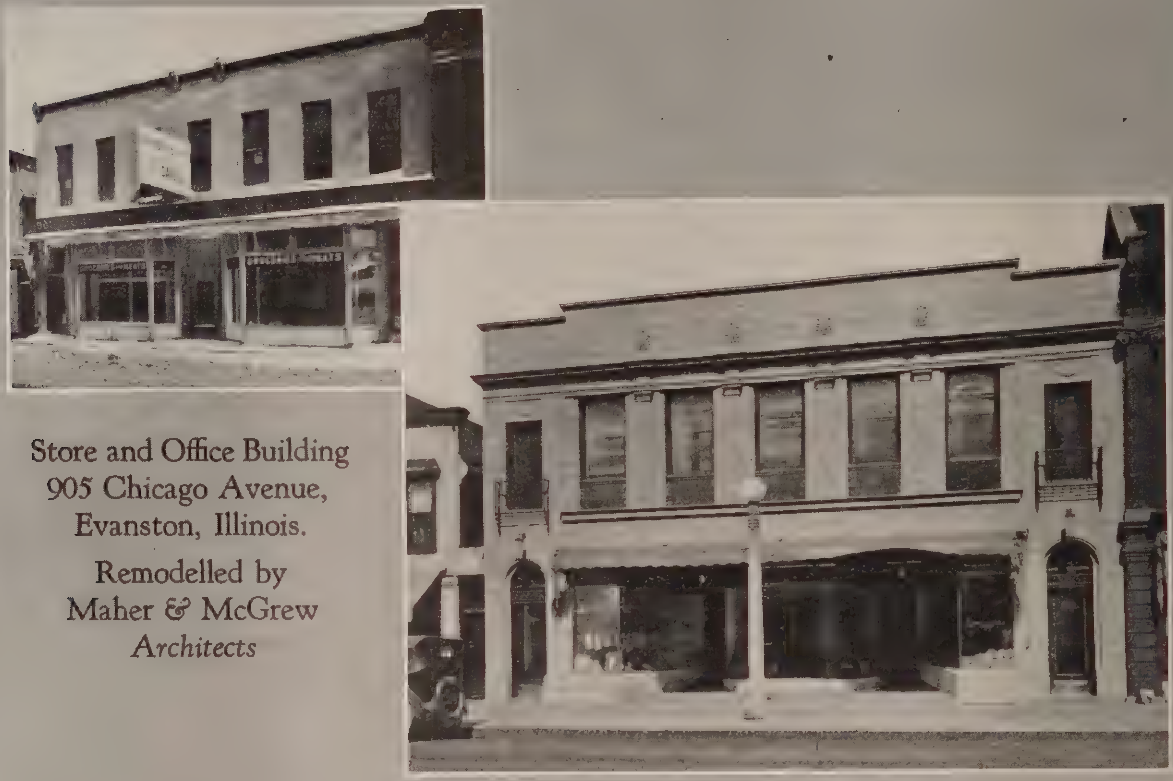

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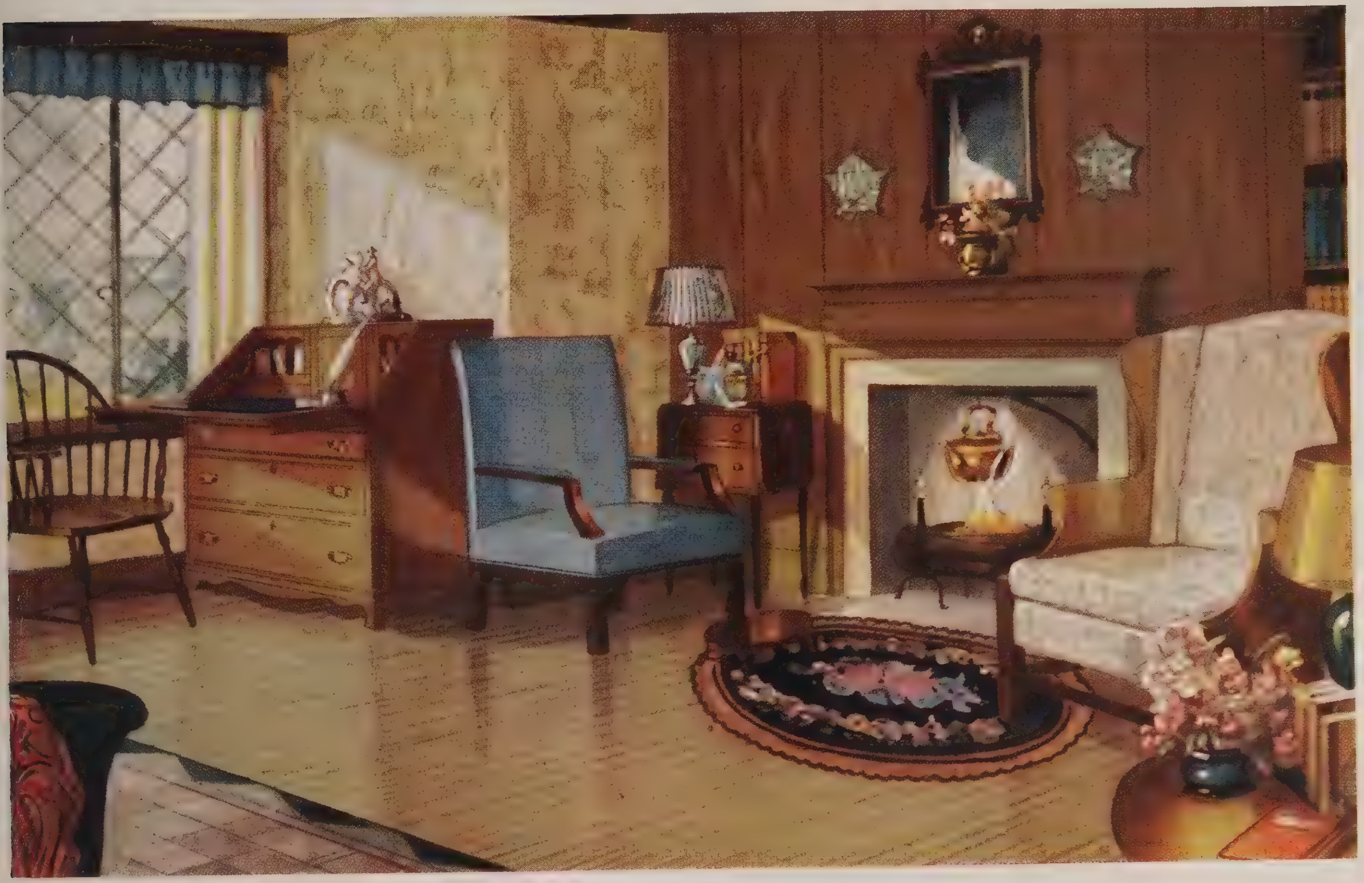

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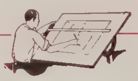

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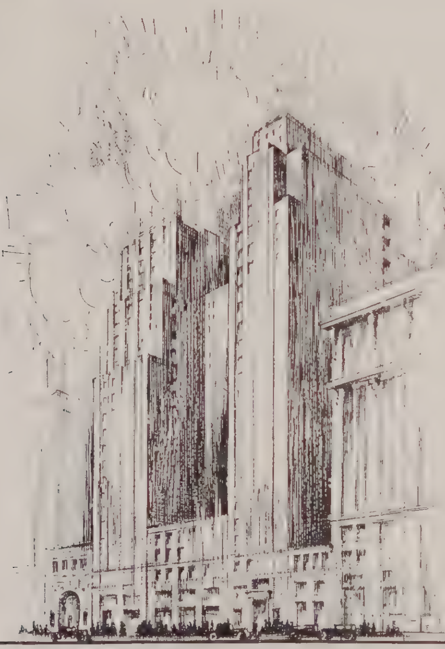

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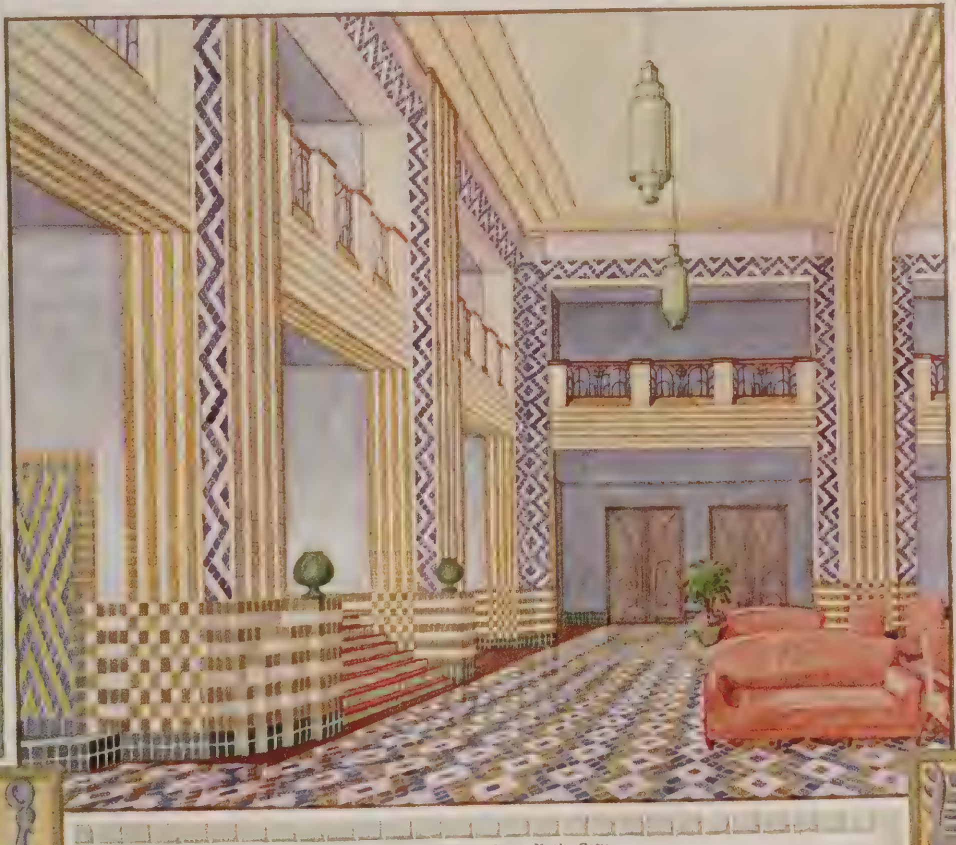

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BOOK DEPARTMENT

HOUSE & GARDEN'S BOOK OF COLOR SCHEMES

A REVIEW BY

NEVA BRADLEY

THE trend of the modern age toward free expression has swept us into a seething pool of color. Never has the world been so color-conscious as today. Modernism in its reaction to the drabness in which we have been submerged for so many years is responsible for the present universal interest in color. Such vivid reminders are being flashed before us at every turn that we are forced to recognize the importance of color and its proper use.

Countless attempts have been made in past years to compile a work that would add to the fund of knowledge to which the decorator might turn for inspiration in the achievement of a house decorated in excellent manner. Many publications, like many flowers, were born to bloom unseen. All too rarely does one find a volume that so clearly, deftly and concisely deals with the subject of color in its relation to interior decoration as does "House & Garden's Book of Color Schemes," edited by Richardson Wright and Margaret McElroy, editor and associate editor respectively of *House & Garden*. Between its covers are collected hundreds of exceptionally well chosen illustrations of walls, living rooms, dining rooms, bedrooms, sunrooms, roofs, garden rooms, kitchens and bathrooms, representative work of well known interior decorators whose various abilities are well recognized. Fully half of the book is devoted to illustrations and to describing color treatments characteristic of each decorative period. The subject is dealt with completely and impartially, from the Renaissance to the present day.

An Eighteenth Century English Interior
Illustration from "House & Garden's Book of Color Schemes"

A fitting introduction to the various period treatments is Weymer Mills' fanciful color impressions of the periods. "Each era seems to have established its own distinctive and unforgettable tints and tones in decorative schemes." Taking up the Renaissance, John H. Hutaff discusses the various merits of the sixteenth and eighteenth century styles of Italian furniture. He gives for an example of the harmonious blending of the two styles an outline of four rooms in a small New York house. Of especial interest among the ten pages of illustrations of excellent architectural interiors and furniture arrangements are the views of Mortimer Levintrett's Venetian residence. Ethel A. Reeve suggests interiors combining vigorous colors with the sturdy furniture of seventeenth century England, while Pierre Dutel covers the eighteenth century Georgian period with color schemes for five rooms, a bath and roof garden. Harold D. Eberlein traces the development of the English Regency style with its vivid coloring and classic lines. In the section devoted to French rooms the adaptation of the colors of the Louis is dealt with by Ruth Lyle Sparks and illustrated with views of interiors done by Diane Tate and Marian Hall, Clarence Mack and others. Usable ideas from both the Directoire and Empire periods are given by Eleanor McMillen. Decorative schemes of Arthur Heun, Thedlow, Inc., and Robert E. Locher illustrate these eras. The picturesque provincial manner, with its mixture of country simplicity and city sophistication, is very adaptable to informal houses in this country. Louise M. Torrance offers some delightful suggestions for rooms furnished with the informal, rustic pieces of France, Italy or Spain. Included are illustrations of four unusual rustic rooms from a house designed in the Basque style by W. Kenneth Rindge.

For the assembling of furniture from both the earlier and the later period of Colonial interiors and for the adaptation of this furniture to modern American interiors, Helen Wells outlines some helpful hints. Among other illustrations are those of a Long Island hunting lodge of which McMillen, Inc., were the decorators and John Russell Pope the architect. One illustration of especial interest depicts old time New England. Charles G. Colman was the architect. The simplicity of modern decoration is well illustrated by Jules Bouy's creations. Since simplicity is the keynote of this era, color naturally comes into the foreground. For those who wish to move on in the spirit of this era, there are plenty of color suggestions by Bruno Paul, exponent of modern types.

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From the title of the work one would be led to expect that the illustrations would be largely color plates. Such is not the case, there being not over half a dozen in the volume. This, however, in no way lessens the helpfulness of the volume in giving the reader a clear color picture of all decorative schemes, be they illustrated or not. Decorator, architect and layman will find in this work inspirational material for the arrangement and design of interiors as well as definite information on choosing pleasing combinations of various tints and tones. The schemes suggested are neither vague nor startling, and they are far from being commonplace and merely "safe." Had anyone just a few years ago been so bold as to attempt to decorate a room in lacquer red, gray and black, the efforts would have provoked little sympathy and much raising of eyebrows. Today we view such a combination with interest. The arrangement may or may not be happy, but the thing is that we are tolerant. Consequently, our color perceptions are being sharpened, and with experience there comes growth.

Despite the interest or possible admiration for certain of the new departures from set color schemes, there is a class of people, be they professional decorators or amateur home lovers, who lack the courage to do what they fear may be thought "extreme." For the benefit of such there is included an article of encouragement by Harold D. Eberlein. "Color courage in decoration is one of the rarest qualities among civilized people of today." Praise is given to the small group which is "well away on the road to complete color freedom." The other and much larger group is urged to have done with conservatism, and to grasp and handle color firmly rather than timidly. A list of 17 refreshing combinations is offered for color-cautious persons to try putting into effect. One example of the possibilities which are bound to make one look at this subject with new eyes is: "Walls—pearl lavender, slightly deeper in tone below the chair rail; woodwork—red, between coral and Venetian, picked out with gold; floor—dark French walnut parquetry; large, plain rug of deep purplish mulberry; hangings of jade green taffeta." Another suggestion which would make anyone listen with unfeigned interest is the description of a little sitting room on the ground floor of a house in Mayfair. "Floor lacquered red; walls and door painted a warm oyster shell gray; door architrave and all other woodwork, black; ceiling, black, highly varnished to pick up reflections; furniture covered in black sateen with white piping, and a few small incidentals of red lacquer along with several old polychrome Chinese pictures." Bold and brilliant color schemes are often exceedingly subtle, and it requires a goodly degree of sophistication either to devise or to appreciate their full significance.

Since color is the most attractive and also the most dangerous element that enters the decorative scheme of an interior, Grace Fakes gives some fundamental and sensible rules to be observed for its development in various rooms. A most unusual and valuable feature of the volume is the "vocabulary" of color for decoration. The definitions cover all the shades, tints and tones through the various reds, divisions of brown, orange, the family of yellows, gold green tones, the blue group, and the violets. The reader will find many usable ideas in the descriptions and illustrations of rooms developed

"*Hotel Planning and Outfitting*"

EDITED BY
C. STANLEY TAYLOR and VINCENT R. BLISS

Here is a volume which for the first time adequately reviews the entire subject of the modern hotel,—its planning, designing, equipping, decorating and furnishing. It covers every detail, from the beginning of sketch plans to the registration of guests when the house has been completed and opened. All the different types of hotels are dealt with,—the Modern Commercial Hotel, the Residential or Apartment Hotel, the Resort Hotel, and the Bachelor Hotel. The volume is replete with views of hotels in different parts of the country; their exteriors and interiors, and in many instances their plans are included and fully analyzed.

The editors have been assisted in the preparation of the work by widely known hotel architects and interior decorators and by actual operators of hotels,—practical men, experienced in the management of the "back" as well as the "front" of a hotel. The volume's treatment of hotel furnishing and equipping constitutes the final word on this important subject. There are included views of hotel restaurants, cafeterias, kitchens, pantries, "serving pantries," refrigerating plants and all the departments which are necessary in a modern hotel of any type. The work is of inestimable value to architects and engineers, as well as to practical hotel men.

438 pages, 8½ x 11½ inches—Price $10

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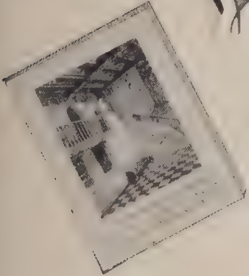

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in the primary tints. It is commonly thought that the use of much blue in the decoration of rooms is to be carefully avoided. Margaret McElroy describes the living room, hall and bedroom of a small apartment in which she combined various shades of light and medium blue with enough warm tones for contrast to prove that it is possible to produce a charming effect by the use of blue as the dominant note. In the outline for four rooms having red as the chief color, Mrs. George Draper shows how this striking but difficult hue can give strength and character to a room. Further proof of this is seen in the illustrations of a red lacquer library decorated by the Frankl Galleries, and a little red, white and blue powder room by Agnes Foster Wright. Mrs. Wright also gives suggestions for five rooms and a porch of a small country house which uses yellow as the main theme. The crisp effect produced by white walls, yellow ceiling and light green rug, or white wall paper with gold lattice design, blue ceiling, and rugs hooked with yellow and mulberry, could leave no room for gloom.

Several unusual sources of color inspiration have been touched upon. That afforded by under-sea life offers an unending variety of unusual designs and novel hues which can be translated into terms of decorative interiors. William Beebe beautifully describes "the exquisite harmony of tints compelled by the pastel perspective of water." Another source which offers endless possibilities is that of the old fashioned flower garden. A bouquet of summer rooms, as suggested by Felicia Adams, is developed from flowers such as mignonette, zinnia and sweet William. Again, if a room be built around one's hobby, it is bound to be interesting. Chamberlin Dodds suggests, if one has a hobby, planning the color scheme of the room around the collection and letting it form a "back drop" for the treasures. He takes, for example, an old Chinese vase on which appear various shades of seven colors, cream white, both jade and apple green, powder blue, lacquer red, eggplant and black; from these he develops four rooms in an unusually pleasing manner.

Kitchens, bathrooms, sunrooms, and occasional small rooms to serve and amuse are fertile fields in which the decorator can splash about gaily. Being a product of our own age, the modern bathroom affords the decorator considerable opportunity for originality. When it was found that beauty and sanitation could be combined, the bath-dressing room with its luxurious appointments began to make its appearance. An account of the development of the modern bathroom is given by Paul T. Frankl. Most effective results are obtained by the liberal use of decoration on wall areas. The possibilities are limited only by the ingenuity of the artist. Among the unusual treatments illustrated is one with the dado finished in silver with walls painted in pale pink and decorated with eighteenth century scenes in umber grisaille. Another by the same artist has silver walls and ceiling with under-sea motifs in black; the tiled dado is in ocher surmounted by black trim; the floor is of black and white tiles. Brilliant tropical designs and murals are being painted on the mirrored walls of bathrooms of today. Pierre Dutel suggests many novel uses for painted glass. Mirrored table tops, mirrored lamps and crystal accessories have offered such endless possibilities that decorators are now extending the use of crystal to larger areas. Dining rooms are lined from floor to ceil-

"CHURCH BUILDING"—*By Ralph Adams Cram*

(A NEW AND REVISED EDITION)

THE improvement which has accompanied the progress of American architecture during recent years has been no more marked in any department than in that of an ecclesiastical nature. This has been due primarily to the rise of a few architects who by travel and study have acquired much of the point of view from which worked the builders of the beautiful structures which during the fourteenth century and the fifteenth were being built over all of Europe.

These architects have closely studied the churches, chapels, convents and other similar buildings in England, France, Spain and elsewhere, and the result has been a number of American churches of an excellence so marked that they have influenced ecclesiastical architecture in general and have led a distinct advance toward a vastly better standard. This improvement has not been exclusively in the matter of design, for plans of older buildings have been adapted to present-day needs, and old forms have been applied to purposes which are wholly new.

THE appearance of a new and revised edition of a work which is by far the best in its field records this progress. Mr. Cram, being perhaps the leader among the architects who have led this advance, is himself the one individual best qualified to write regarding the betterment of ecclesiastical architecture. The editions of this work of 1900 and 1914, which have for some time been out of print, have now been considerably revised and much entirely new matter has been added, which in view of the change which has come over ecclesiastical building of every nature is both significant and helpful.

Illustrations used in this new edition of "Church Building" show the best of recent work—views of churches and chapels large and small, in town and country, buildings rich in material and design and others plain to the point of severity, with the sole ornament in the use of fine proportions and correct lines. Part of the work deals with the accessories of the churches and their worship.

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ing with mirrored glass painted in Chinoiserie motifs. Powder rooms are walled with sectional mirrors. One powder room, which was converted from a coat closet, has pink walls, shading to a deep pink at the bottom; diamond shaped, blue backed mirrors and a blue ceiling studded with mirrored stars. Another illustration of an occasional room is that of a private bar with walls painted in scenes of Broadway in 1860 to suggest an old fashioned sidewalk bar. Painted walls are being used successfully in sunrooms as well as in less used portions of a house. The sunroom has evolved into a gay and cheerful meeting place for the blending of outdoor and indoor comforts. Elsie Cobb Wilson describes several examples of what has been done in such rooms. It is probably from the sunroom that the idea of garden rooms came into existence. Ruby Ross Wood discusses various methods of giving an illusion of outdoors to a city room. One delightful room of which she writes was built around an old English painting of a smocked gardener leaning on his hoe, with a prim Queen Anne garden around him. Roof gardens with their painted awnings and wrought iron wall decorations receive their due from Mrs. George Draper. The cheeriness of sunrooms is now being carried into that most essential of rooms, the kitchen. Perhaps the secret of keeping a contented cook may be found in the pages which give some colorful combinations showing possibilities in the adaptation of kitchen decorations of other lands. Irene Sidley lists some practical schemes for a French provincial kitchen together with two suggestions based on the sunny and cheerful kitchens of Portugal and Spain.

Many other subjects are dealt with just as interestingly. Richardson Wright, the editor, throws a new light on the adoption of color in this country. He believes that to some degree we can attribute our increasing interest in color to legislative Prohibition. "The tendency toward color may have been evident before Prohibition went into effect, but it did not enjoy universal acceptance until after the average man and woman found their habits repressed by legislation." He parallels the present enthusiasm for early American furnishings with prohibitive legislation. This demand for early American decorations is one reason for the growing popularity of painted floor decorations. A monograph by Jane Stewart on stencil borders, spatter effects and checkered designs and their suitability to certain rooms gives exact information for the application of both the design and the paint. For those who like an occasional piece of painted furniture as well as for those who prefer groups of painted pieces for cheerful little cottages, there are two pages filled with sketches of unpainted furniture, both modern and period reproductions, with usable color suggestions. In the back of this volume, from which nothing seems to be lacking, there is a valuable list of publications concerning decoration, and also the names and addresses of decorators, architects and artists. The work will be useful not only to architects and interior decorators but likewise to that large and constantly growing number of home owners who are interested in decoration. Its illustrations have been admirably chosen.

HOUSE & GARDEN'S BOOK OF COLOR SCHEMES. By Richardson Wright and Margaret McElroy. 227 pp., 9½ x 12¾ ins. Price $5. Conde Nast Publications, Inc., 420 Lexington Avenue, New York.

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"*A History of Architecture on the Comparative Method*"

By Sir Banister Fletcher, F.S.A., F.R.I.B.A.

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But it is sometimes possible to improve even a well known and standard work, and the History of Architecture, now appearing in its Eighth Edition, has been revised and enlarged, and considerable new matter has been added. The Eighth Edition possesses every valuable characteristic of the earlier editions, and it includes, besides, the results of recent travel and research to increase its value.

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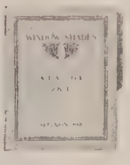

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THE EDITOR'S FORUM

THE HOLABIRD & ROOT EXHIBITION

November 21—December 12

THE Architectural League of New York has instituted a series of one-firm or one-man exhibitions with a presentation of the work of Holabird & Root, of Chicago. This departure from its time honored custom of holding only one important exhibition each year, the annual show at either the Grand Central Palace or at the galleries of the National Academy of Design, is a step in the right direction. Such an immense number of photographs and drawings as well as material representing the arts and crafts and interior decoration is presented for inclusion in each of the annual exhibitions, that it is never possible to adequately present the work of any one man or one firm. It was therefore decided by the present Exhibition Committee of the Architectural League of New York to augment the annual exhibition by a series of smaller displays in the galleries of the Architectural League House. The present exhibition of the work of Holabird & Root will be followed, the latter part of December, by an exhibition of the work of Lee Lawrie, the well known architectural sculptor and designer. The third exhibition, which will open early in January, will present the work of Eliel Saarinen.

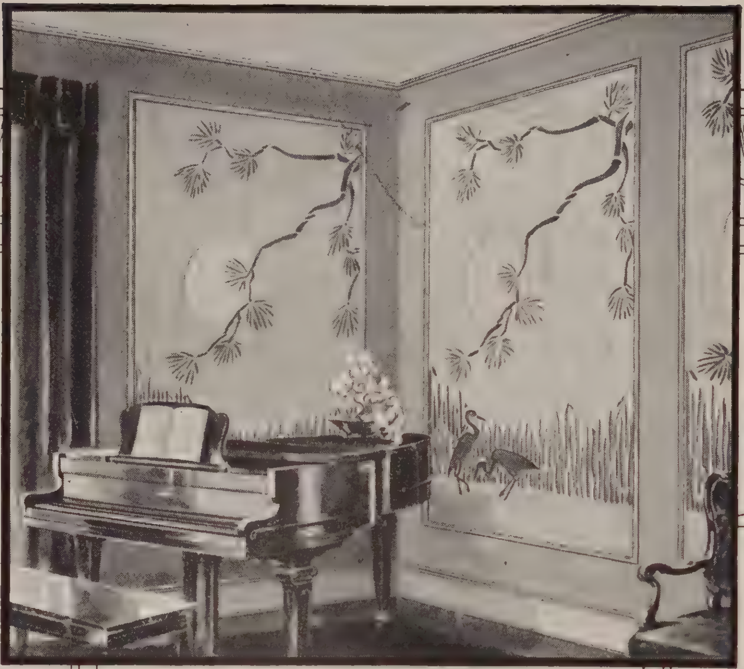
The value and importance of these one-man and one-firm exhibitions cannot be too strongly emphasized. It is fortunate for the profession in New York that the Architectural League has begun this important movement, which should be far-reaching in its effect upon the work of the profession locally. It is most important that one architect should be thoroughly acquainted with what other architects are doing. Such knowledge tends to give a more definite and uniform trend to architectural expression in the country as a whole. If architects are without contact with the work being done by the profession in other parts of the country, their work is likely to suffer through an over amount of individuality and narrowness of conception.

Although the architectural journals, as far as they are able in a limited amount of space, attempt to present from month to month as many examples as possible of the best work of every type being done in every section of the country, they are seldom able to devote the amount of space necessary to an adequate or complete presentation of the recent work of any man or firm, and yet unless such a complete presentation is made, it is impossible to obtain an adequate idea of the breadth and scope of the work of any firm or individual. The Exhibition Committee of the Architectural League of New York is to be congratulated upon its choice of the work of Holabird & Root for the first of this series of one-man or one-firm exhibitions. Among the younger firms of Chicago architects, and both men the sons of architects prominent in Chicago 30 years ago, John Holabird and John Root have already made a definite impression on the architecture of their native city. Their work covers a variety of architectural types. Commercial buildings, hotels, restaurants, clubs and private houses are included in the recent examples of their work. Possessed of an unusual grasp of the underlying principles of architectural design, their buildings are a logical development of plan and elevation, of design and decoration. Embodying a distinctly new note and a fresh expression in architectural design, work of these young architects is making one of the most marked contributions to the present development of a distinctly American architectural style. Their work shows a marked appreciation of scale and proportion, a consummate understanding of the value of masses, and an unusual appreciation of the importance of a proper relation between window spacing and wall surfaces. Their buildings without exception possess unusual restraint and dignity, relieved by an intelligent and consistent use of appropriate ornament.

The exhibition of their work in the main gallery of the Architectural League House in New York is a remarkable example in itself of a superb presentation of carefully selected and architecturally arranged series of photographs, drawings and models. The restraint in their architectural designs is satisfyingly repeated in the delightful arrangement and balanced grouping of the exhibition itself. Although it is distinctly modern in conception but conservative in expression, the architects of New York should derive much information and receive fresh inspiration from a very careful and appreciative study of the splendid work of the firm of Holabird & Root.

NEW YORK APARTMENT HOUSE MEDALS

THE New York Chapter of the American Institute of Architects invites architects of apartment houses to compete for two "New York Apartment House Medals." The buildings to be listed as entries must have been erected in either Manhattan or Bronx and completed between October, 1928 and October, 1929. The entries are to be divided into two classes, one class consisting of buildings of six stories or under, while the other consists of structures of more than six. Entries must be submitted before December 15, 1929. Information regarding the awarding of the medals may be had of the Chairman of the Apartment House Medal Committee, Philip L. Goodwin, 607 Fifth Avenue, New York.



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A leading personality in the world of art, Thomas Hastings, attained preëminence and held it longer than is the lot of most men. The series of great buildings which bear his name are known to his contemporaries at home and abroad. Two of his early works still stand forth as epoch making, the Ponce de Leon Hotel at St. Augustine, Florida, which immediately set a new standard in American architecture, and the Blair Building on Broad Street, New York, which marked the first step in the development of logical design for tall buildings. His most recent work was the re-designing and re-building of the senate wing in the capitol at Washington, and at the time of his death he was occupied on the architectural design of a new bridge to span the East and Harlem Rivers. Although Thomas Hastings has passed on, the rare charm of his personality lives in the hearts of a host of friends in whom, through a peculiar human quality inherent in a vivacious and ever youthful disposition, he inspired real and widespread affection. He loved people and people loved him. Socially and artistically the world loses in his passing, but his spiritual qualities so plainly characteristic will keep his memory intimately alive long after most of his contemporaries are forgotten. He carried this precious active quality into his work. He believed that no matter how great the demands on an architect's time might become, he should always draw and design every day and most of the day, and he lived up to this precept. His work, therefore, bore the unmistakable imprint of his individuality and had much of the humanness so characteristic of the designer.

He was fond of reading and even in these crowded modern days, amid the insistent social demands naturally made upon a man of his high prestige and great charm, he kept abreast of the best of contemporary thought. Interested in people, he was naturally interested in human affairs. These interests were widespread. He never lost touch with the Old World, and the Old World delighted to honor him. Chevalier of the Legion of Honor, member of the Institute of France, fellow of the Royal Institute of British Architects and Royal Gold Medalist in England, the two European countries he knew so well placed him high on their rolls of honor. In America every distinction that can come to an artist was his.

Everett V. Meeks.

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EDITORIAL FOREWORD

THE editors of The Architectural Forum take this opportunity to express to each member of the Editorial Advisory Committee and to each editorial contributor their sincere appreciation of the coöperation extended during the preparation of this Hotel Reference Number. This background of practical experience has enabled them to present a comprehensive treatise on hotel building which will prove invaluable.

It is a source of gratification to the editors to present to the architectural profession this Hotel Reference Number, which is the largest single issue of an architectural magazine yet published. It is only through the coöperation of the leaders in the hotel field—the Editorial Advisory Committee,—the architects who have specialized in hotel architecture, and the authorities on various phases of hotel engineering, equipment and business,—that such a volume of comprehensive and instructive material can be presented. The contents has been prepared and arranged for maximum usefulness, not only the editorial material but also the pertinent advertising pages.

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Hotel Reference Number 1929

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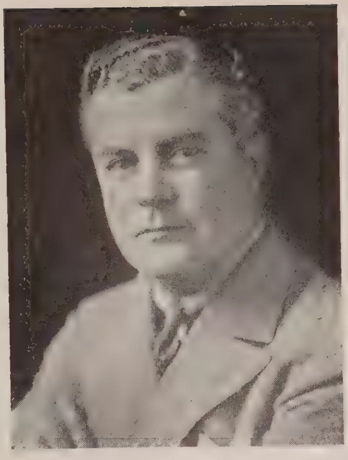
John McEntee Bowman

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VOLUME LI NUMBER SIX

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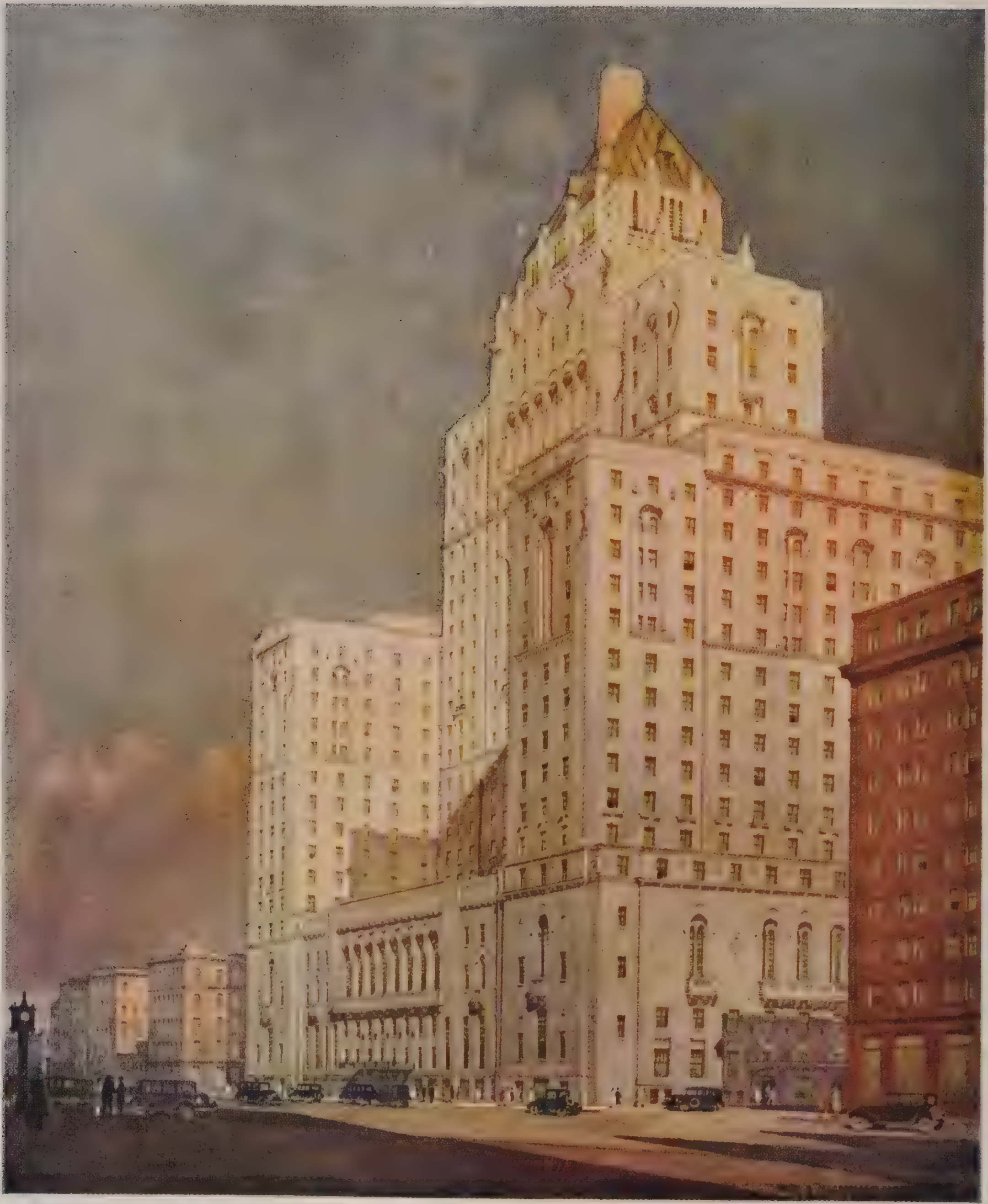

ROYAL YORK HOTEL, TORONTO

From a Water Color Drawing by S. H. Maw

ROSS & MACDONALD, ARCHITECTS
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THE
ARCHITECTURAL
VOLUME LI FORUM NUMBER SIX
DECEMBER 1929

THE NEW HOTEL

BY

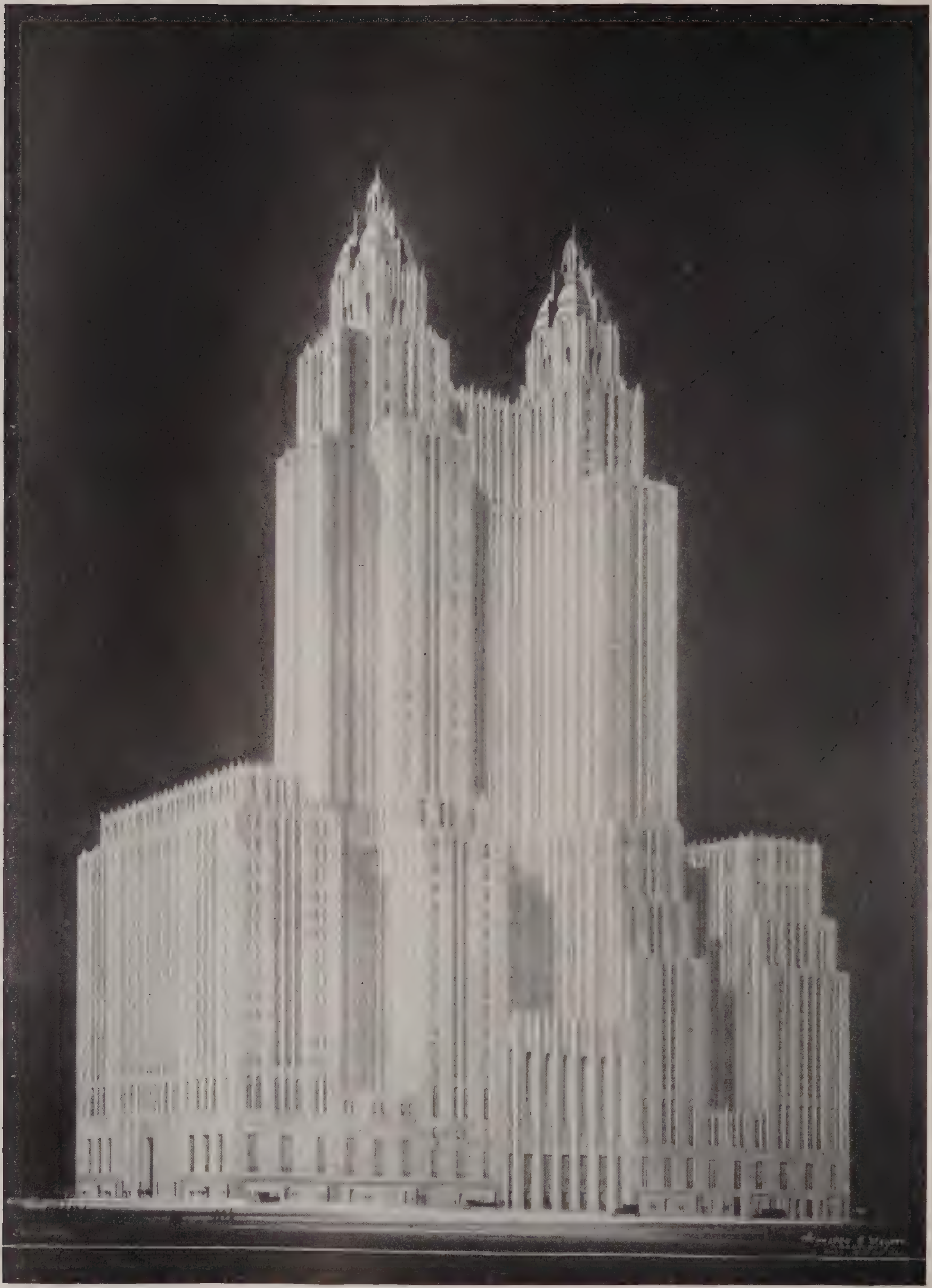
PARKER MORSE HOOPER

WHEN I asked Leonard Schultze to write on the modern hotel, he said frankly that he had told all there was to tell as far as a general outline of the subject was concerned, in the brief article he wrote for the first Hotel Reference Number of THE ARCHITECTURAL FORUM six years ago in November. At that time hotel planning had already reached a high stage of development and perfection. Every known feature of comfort and service in plan and equipment had been carefully thought out, created and included. The past six years have shown little improvement in the designing and planning of hotels because there was little opportunity or room for further improvement. Architects specializing in this important field of design have devoted years of conscientious study and thought to the problem. In the designing of neither commercial structures nor hospital buildings has greater progress been made. So, although the new hotel of today may be and probably is bigger than the hotel of six years ago, there is little chance of its being better. As far as hotel planning is concerned, the problem remains unchanged. It involves, as always, the combination of two salient factors,—a suitable return on the money invested and maximum comfort and convenience for the hotel guest.

As far as exterior design is concerned, it is important today not to lose sight of the danger of a superficial modernism being mistaken for a basic modernism of structural principles. If we are to trade dignity for mere decorative tricks in architecture and call it "modernism," we will have made a poor exchange. The problem which every architect must face is that of evolving a simple and intelligent style in which to clothe modern construction, and anything else is not at all likely to be good architecture. Distinct from structure is plan, and it is safe to say that no building ever has been or ever will be better than its plan. A poorly planned building, no matter what may be its architectural dress, will be a poor building, and this is no more or less true of the hotel than of any other type of building. Hotel planning has improved gradually through years of constant development and has now become an epitome of convenience and efficiency, as may also be said of hotel equipment. Advance, here, is brought into the consciousness of the public through even the daily press in articles such as those about the demolition of the old Waldorf-Astoria, which, when it was built some 35 years ago, was the last word in elegance and service. It was the model followed by designers of all large hotel projects for years afterward. Now it is out of date, old fashioned, uneconomical.

The new Waldorf-Astoria will be stylistically semi-modern and, in its planning, equipment and service, completely modern. It should, in this one of its many aspects, mark an epoch as definitely as did the old Waldorf-Astoria in its day. The new hotel will be definitely modern in mass, and modern in detail with such æsthetic reservations as not to inflict upon the eyes of 1940 or 1950 any mere transitory architectural fancy of 1930. And this will be as true within, where modernism will take the form of a certain sophistication in the treatment of an Empire-Directoire theme. Modernism that goes further than this is likely to find itself out of date, even if it is attractive to the more sophisticated mood and taste of the present moment.

It is not my intention here to go into details of the new Waldorf-Astoria, even though it might be fairly safe to guess that certain new features of its design will affect hotel design in general. The tower will be laid out in apartments for permanent guests, as in the Sherry-Netherland. About halfway up in the height of the building there is to be a large terrace roof garden, the kitchen of which, a complete unit, will not only serve the roof garden, but also room-service 20



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FINAL STUDY, WALDORF-ASTORIA HOTEL, NEW YORK

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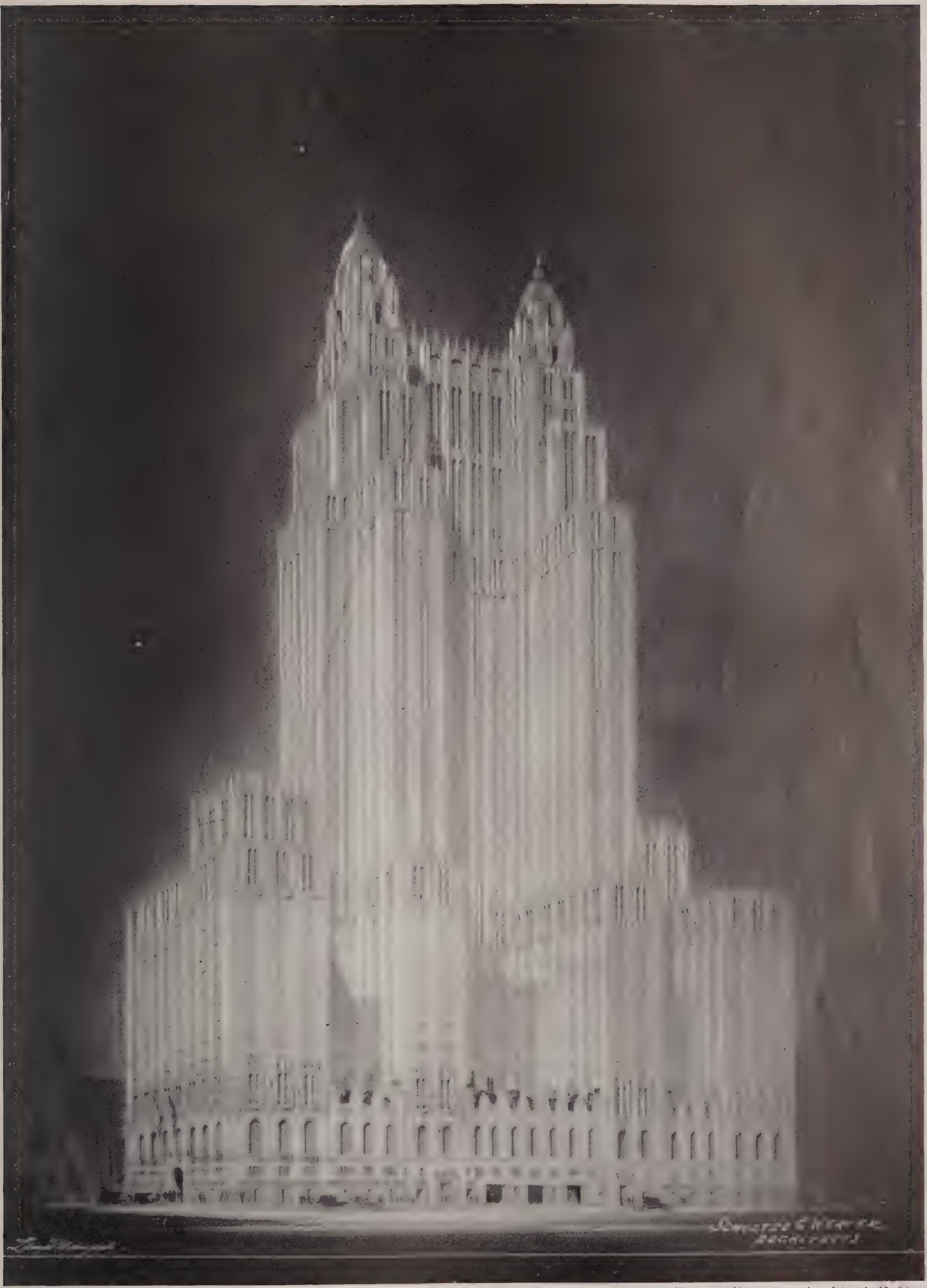

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PRELIMINARY STUDY, WALDORF-ASTORIA HOTEL, NEW YORK
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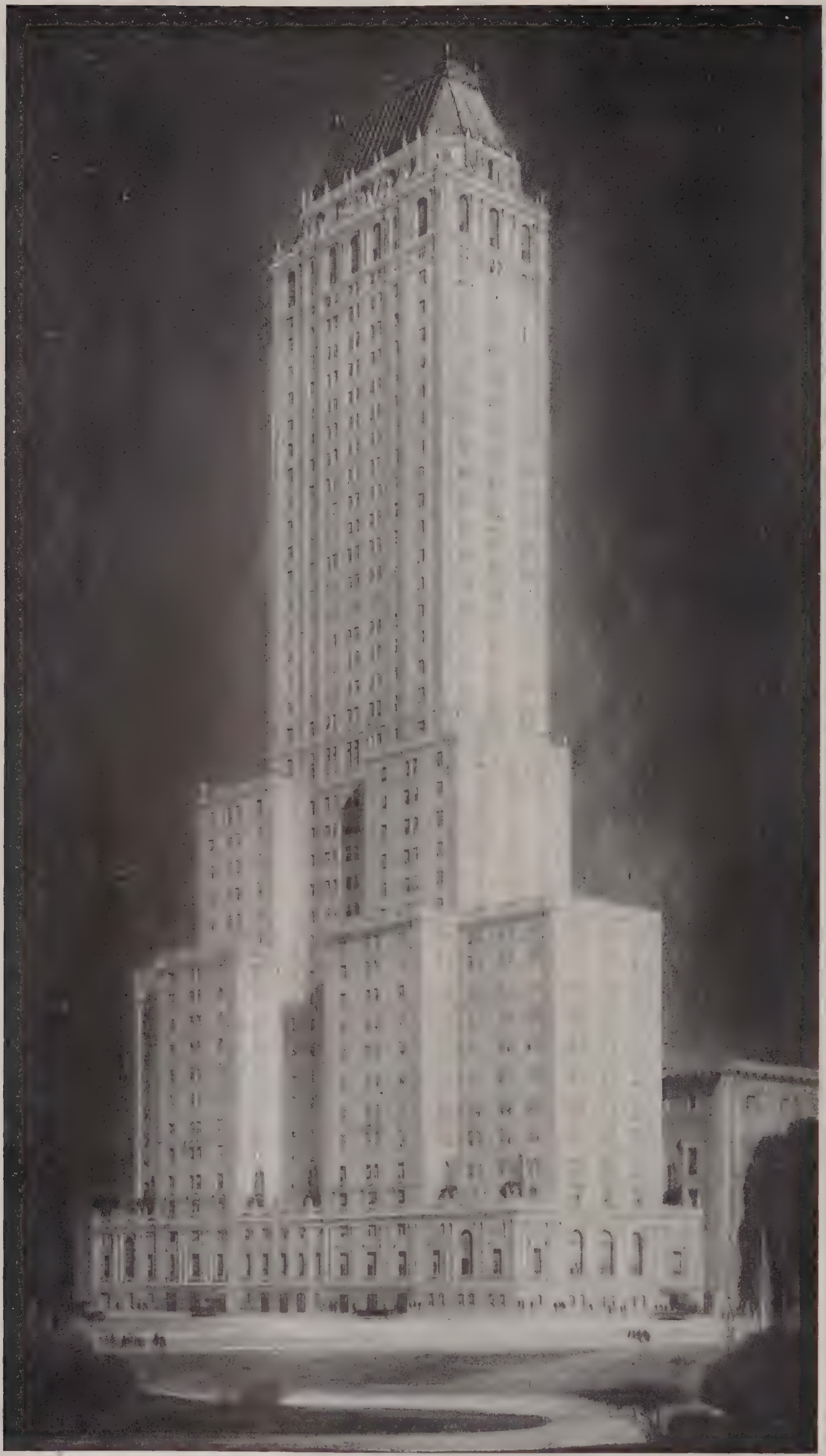

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HOTEL PIERRE, NEW YORK
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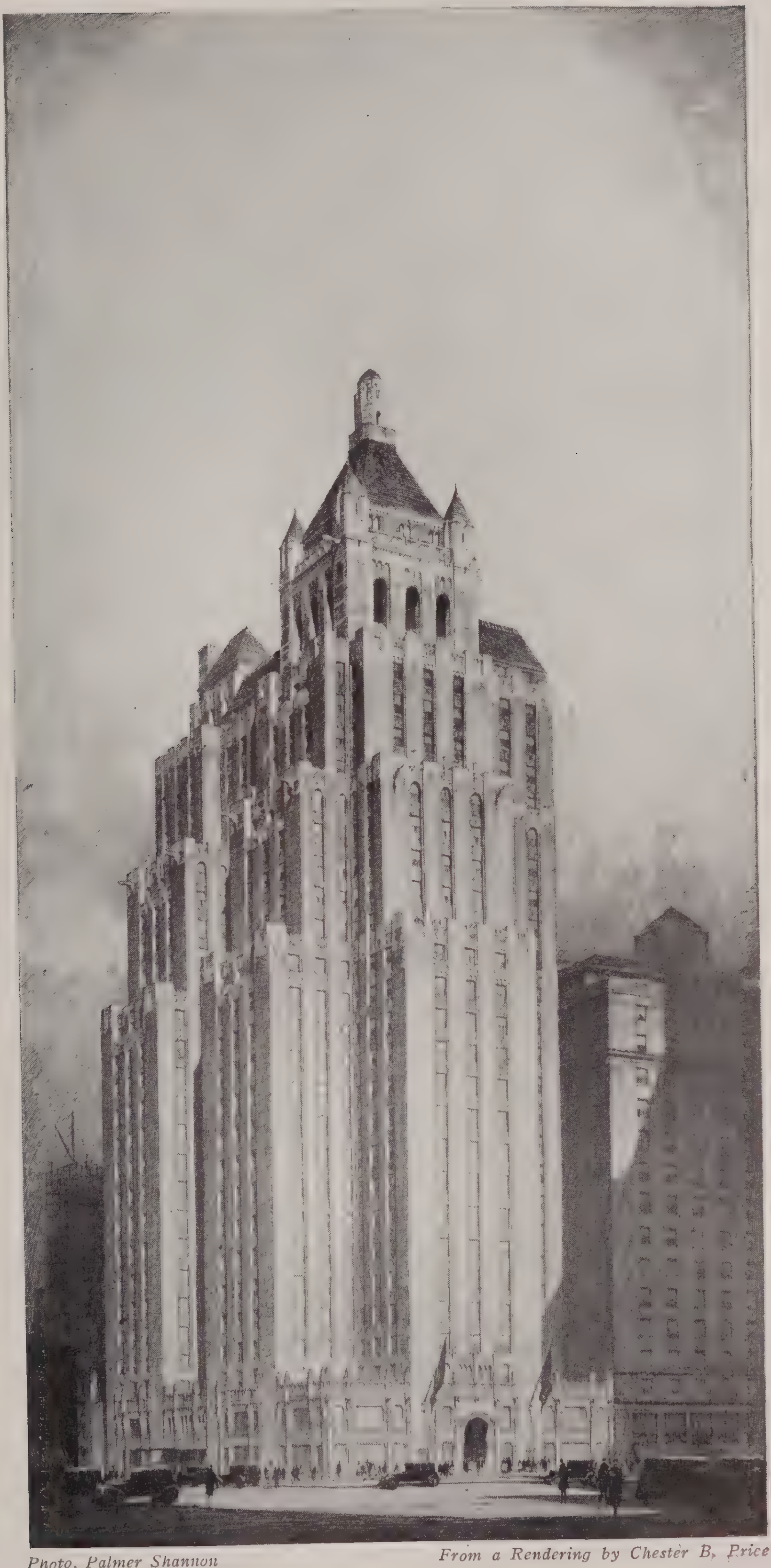

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HOTEL LEXINGTON, NEW YORK
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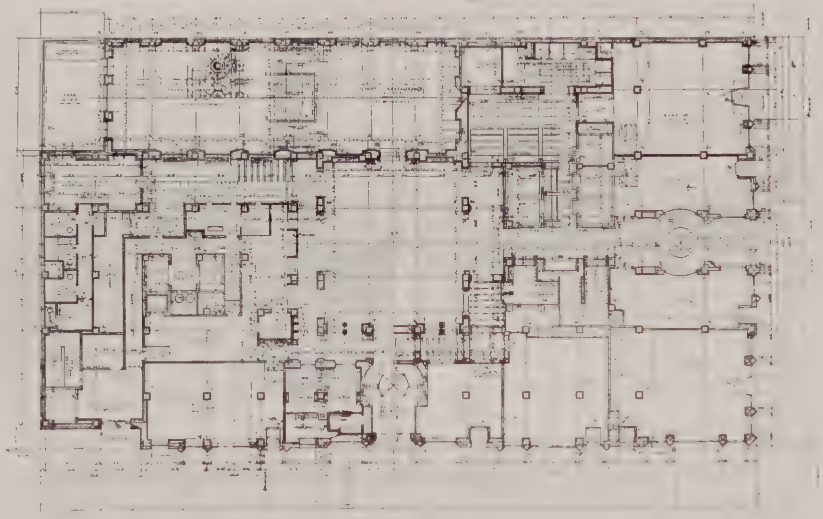

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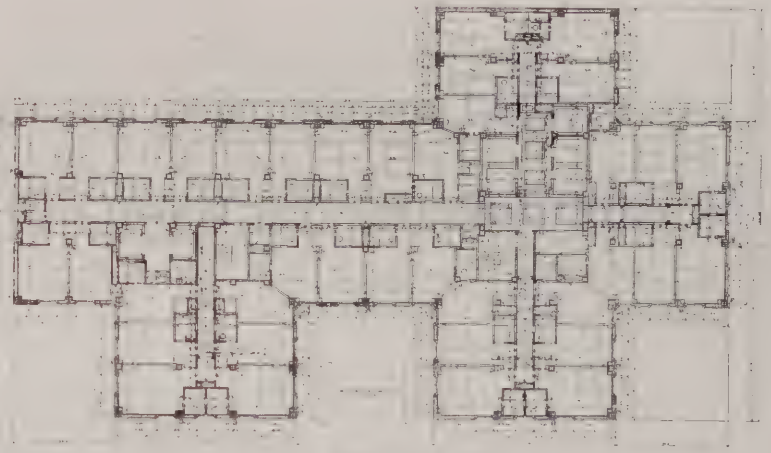

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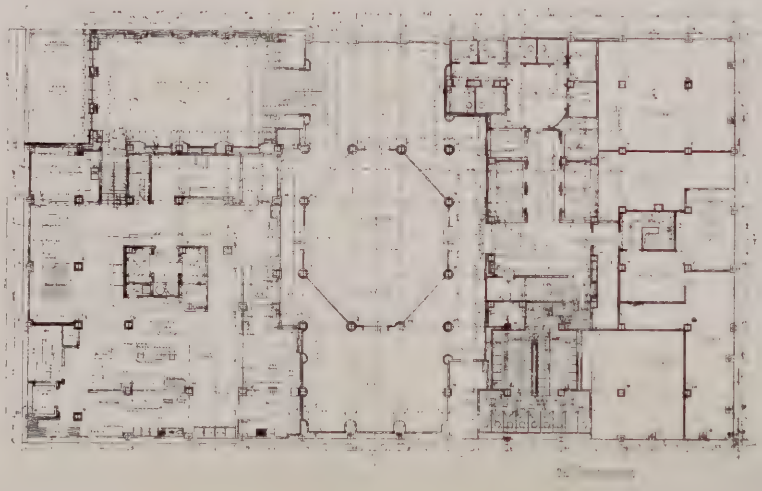
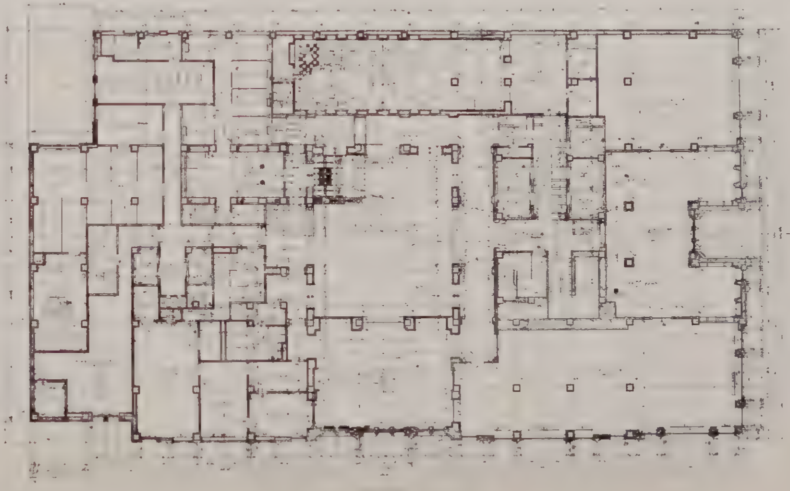


BASEMENT



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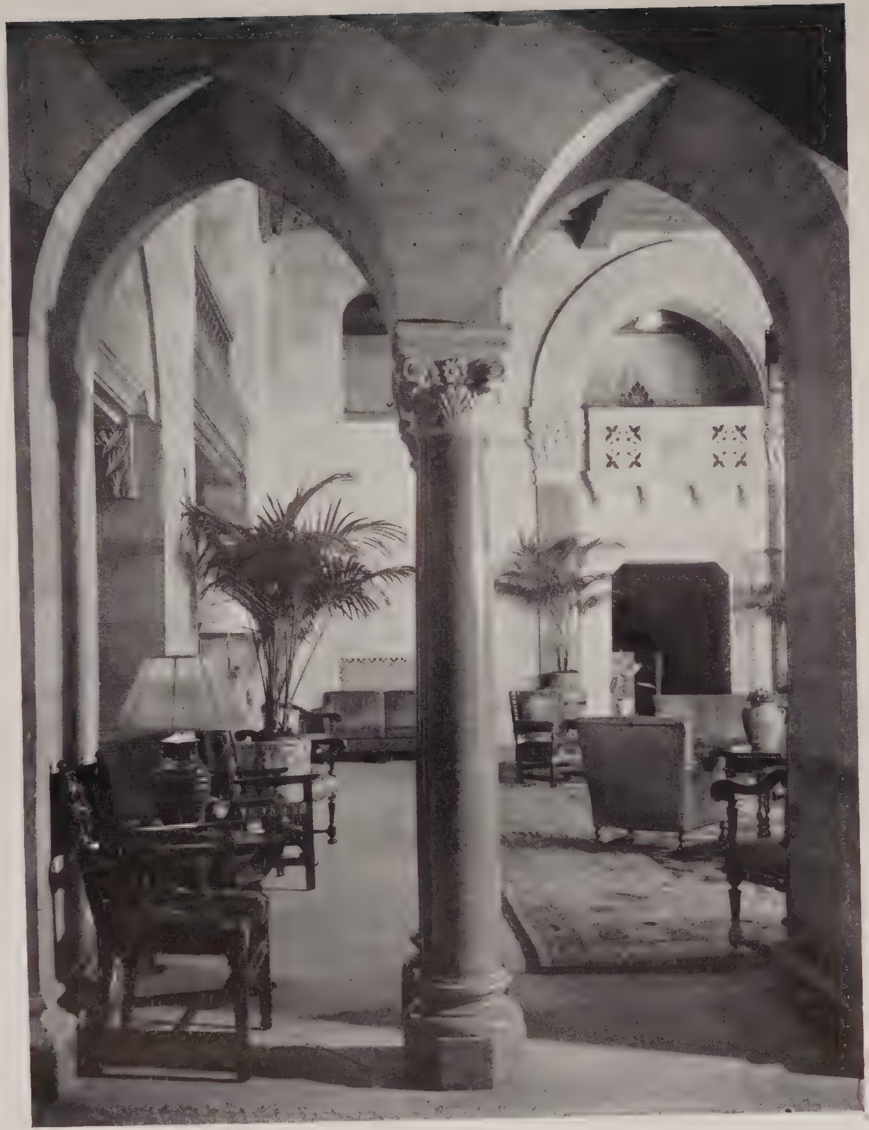

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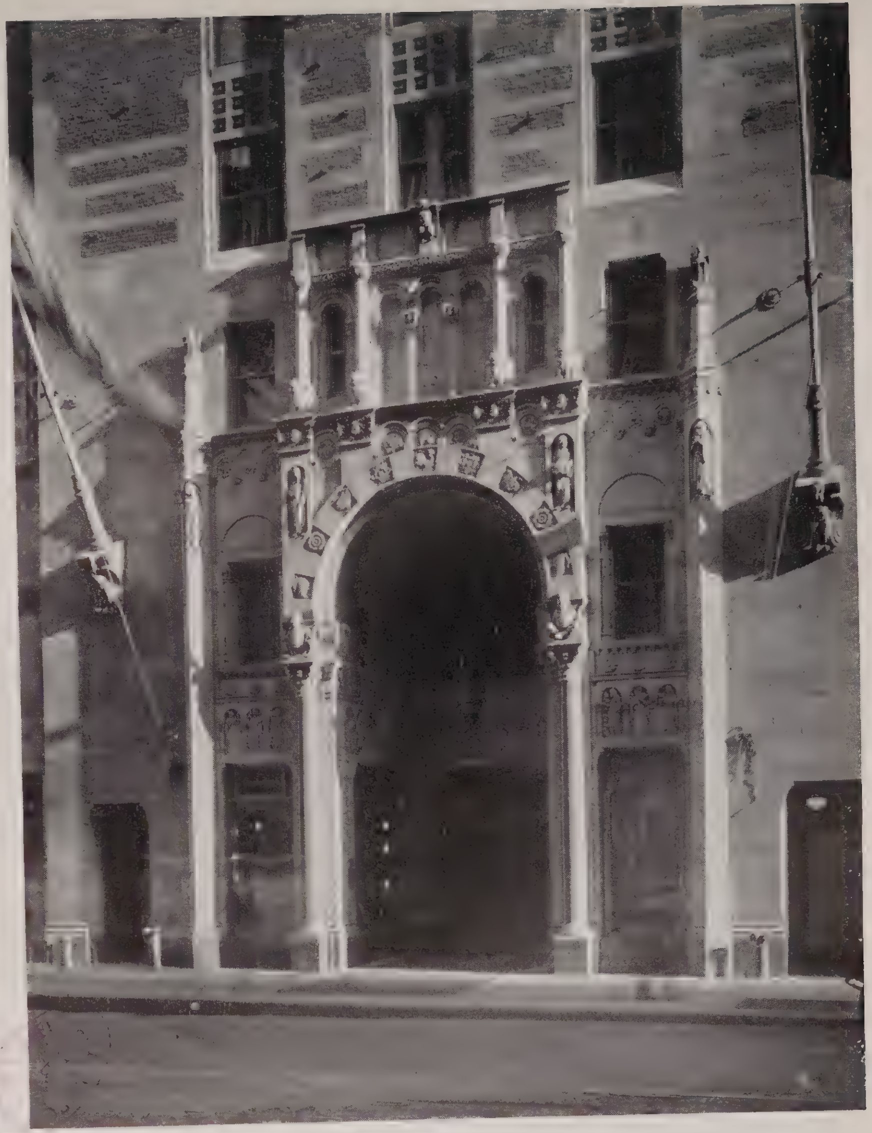

ENTRANCE DOOR

HOTEL LEXINGTON, NEW YORK
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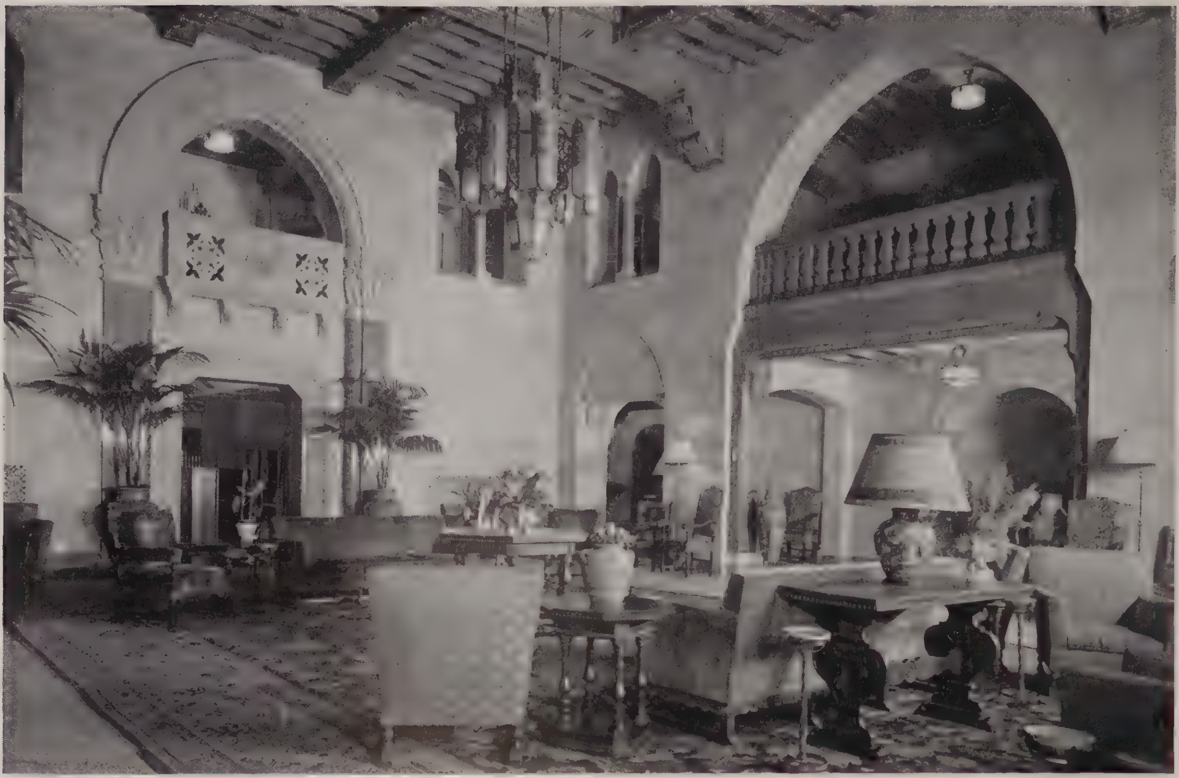

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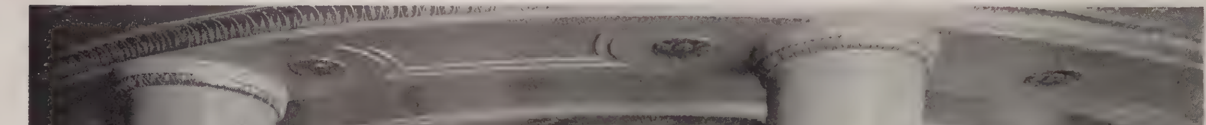

GRILL ROOM

HOTEL LEXINGTON, NEW YORK

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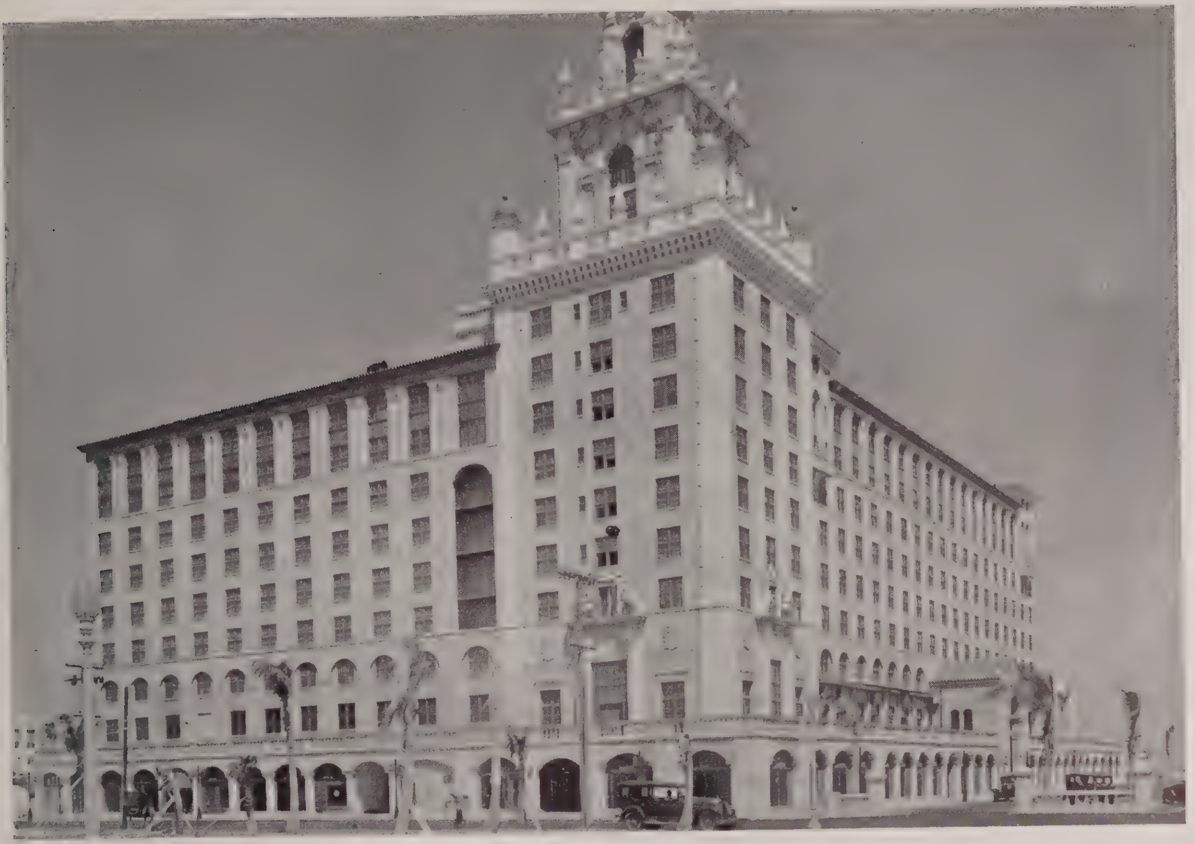

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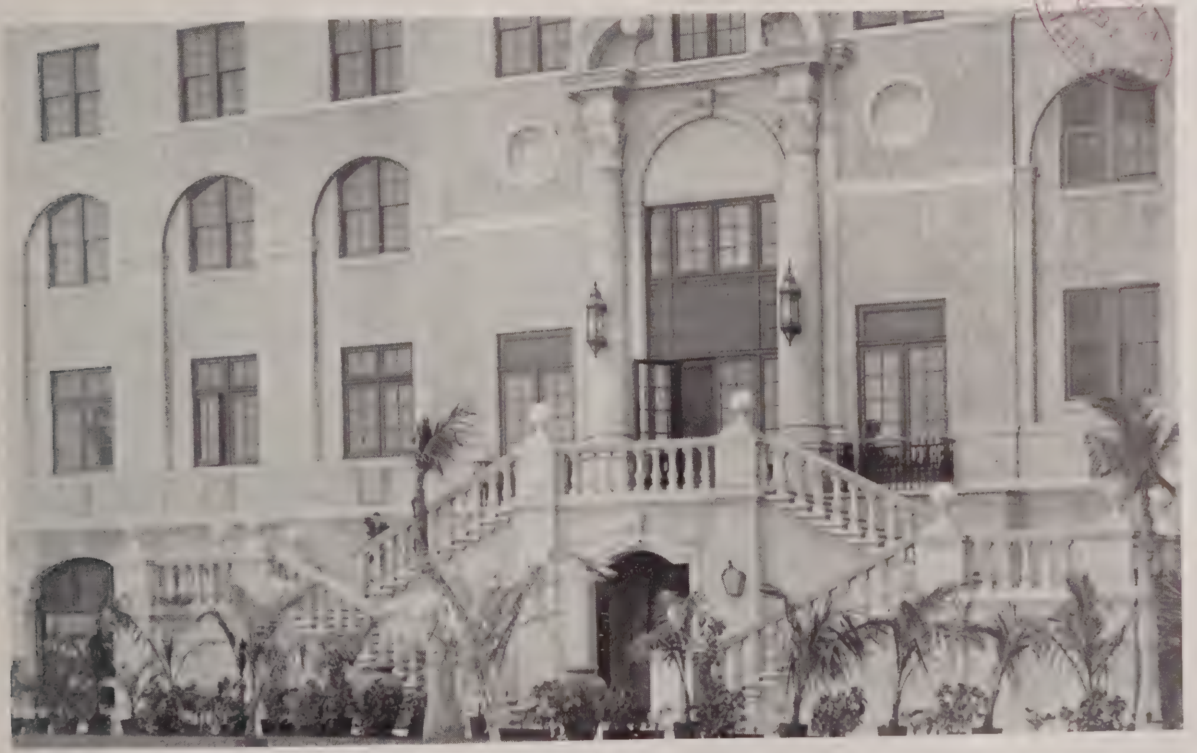

Photos. Amemya

GARDEN ENTRANCE

RONÉY PLAZA HOTEL, MIAMI BEACH, FLA.

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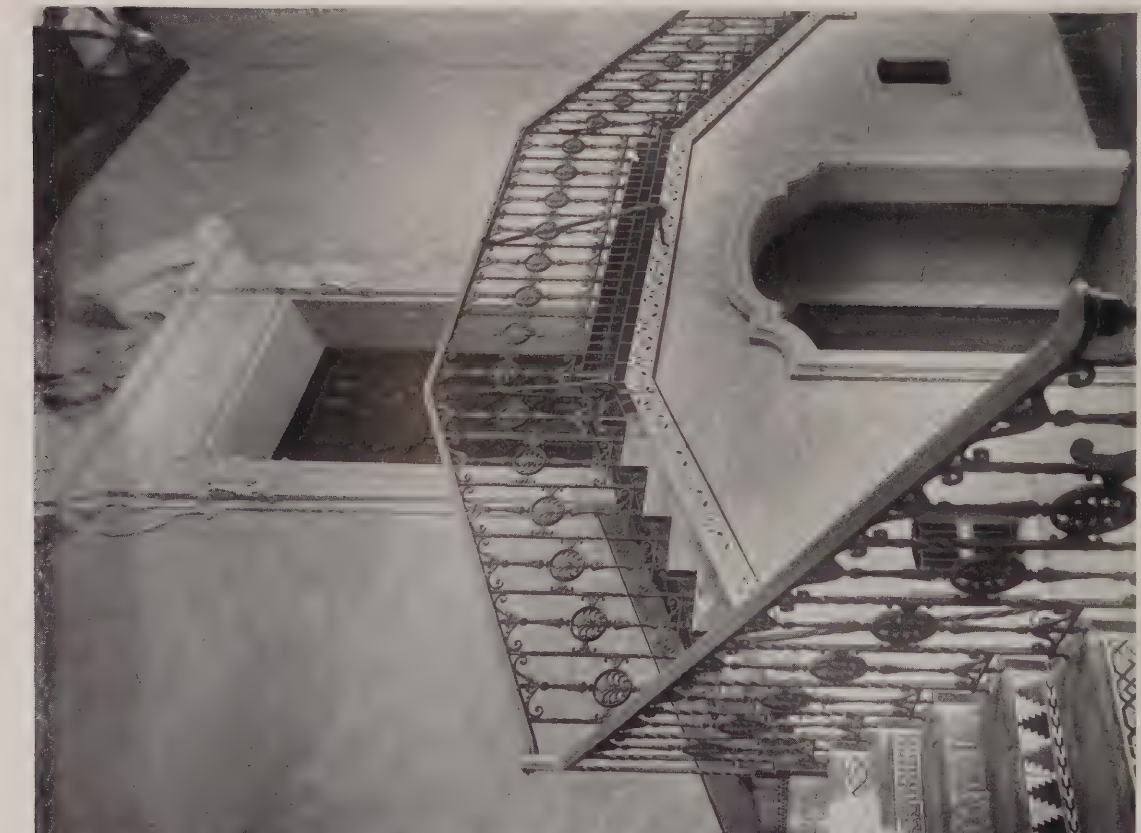
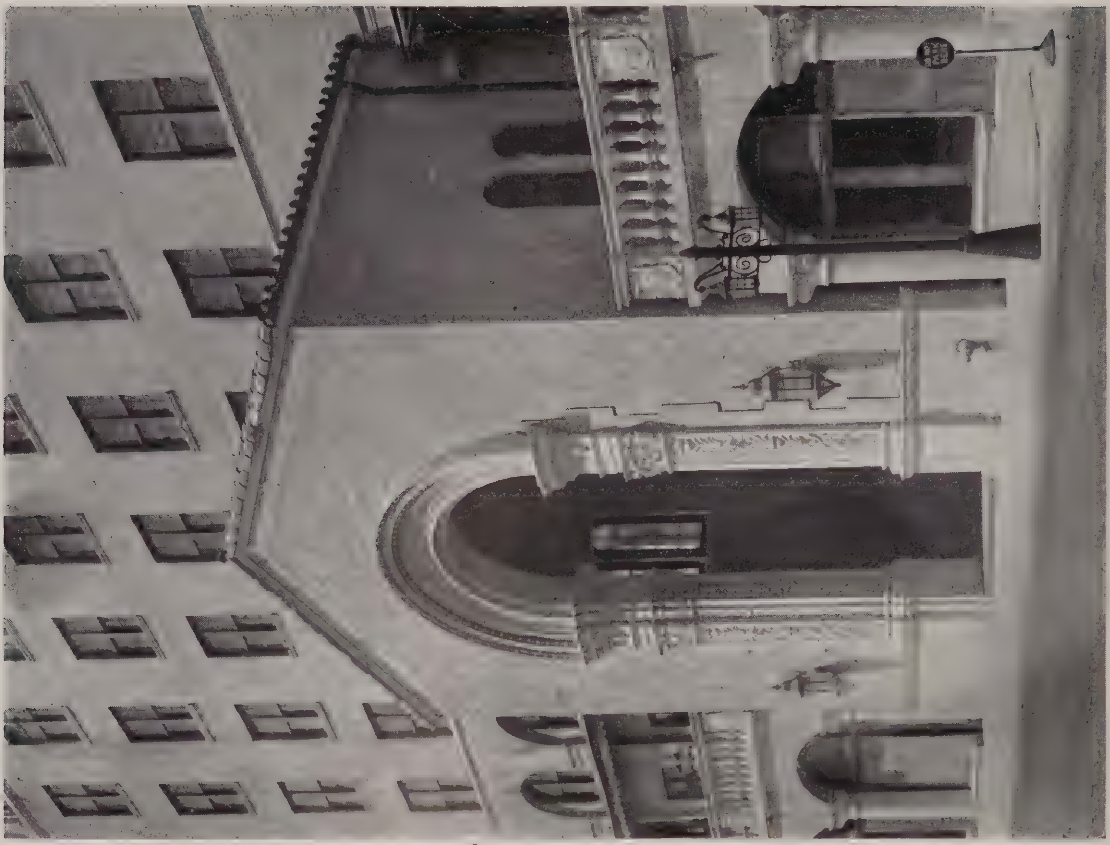


ENTRANCE STAIRWAY



MAIN ENTRANCE

RONEY PLAZA HOTEL, MIAMI BEACH, FLA.
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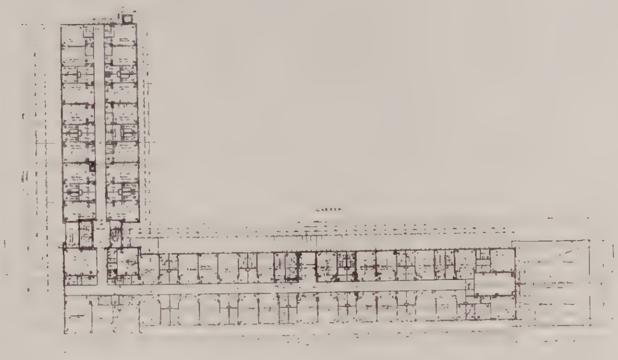

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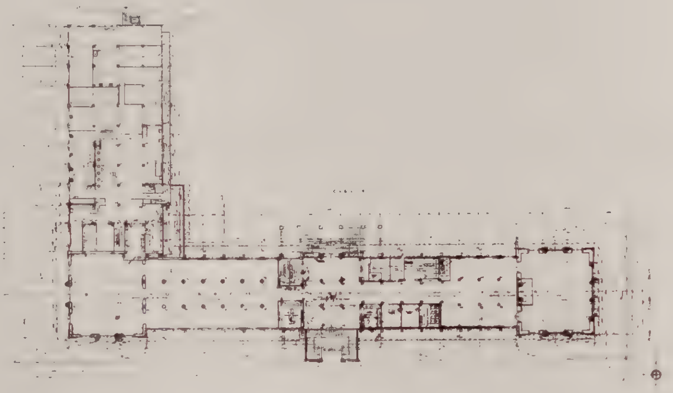
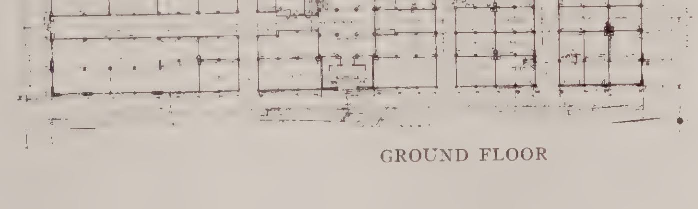
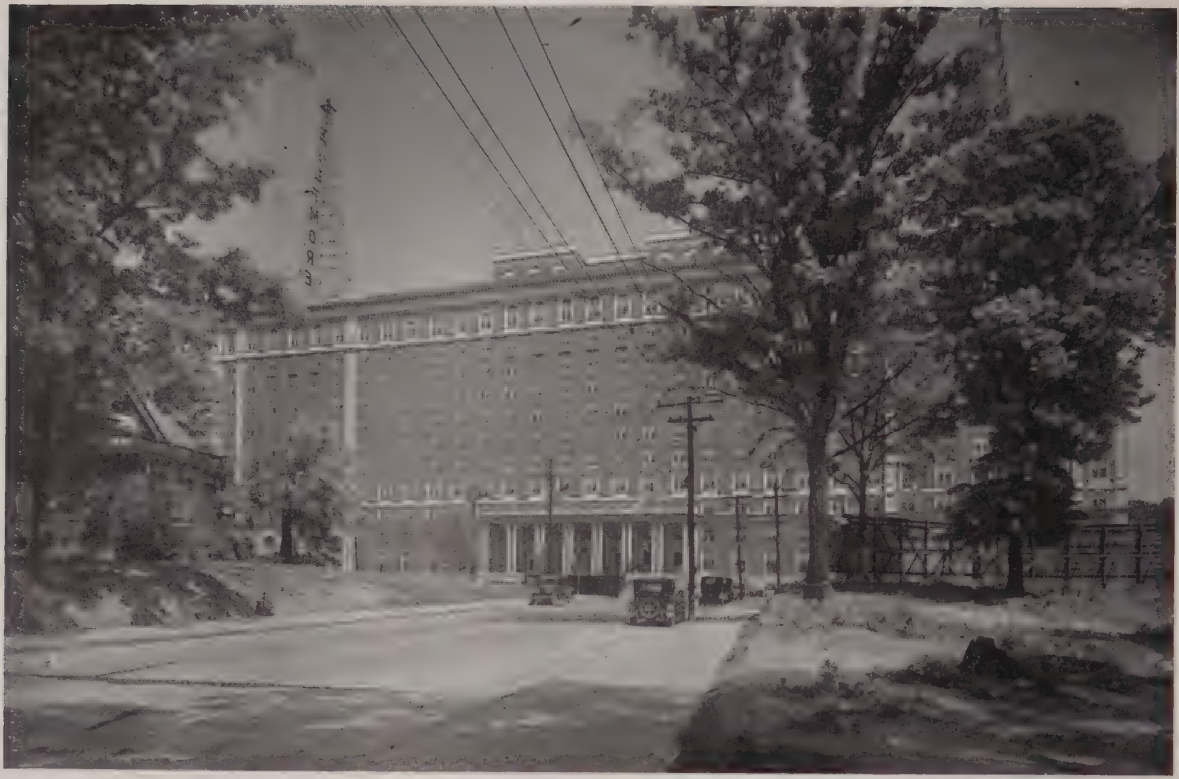


MAIN FLOOR

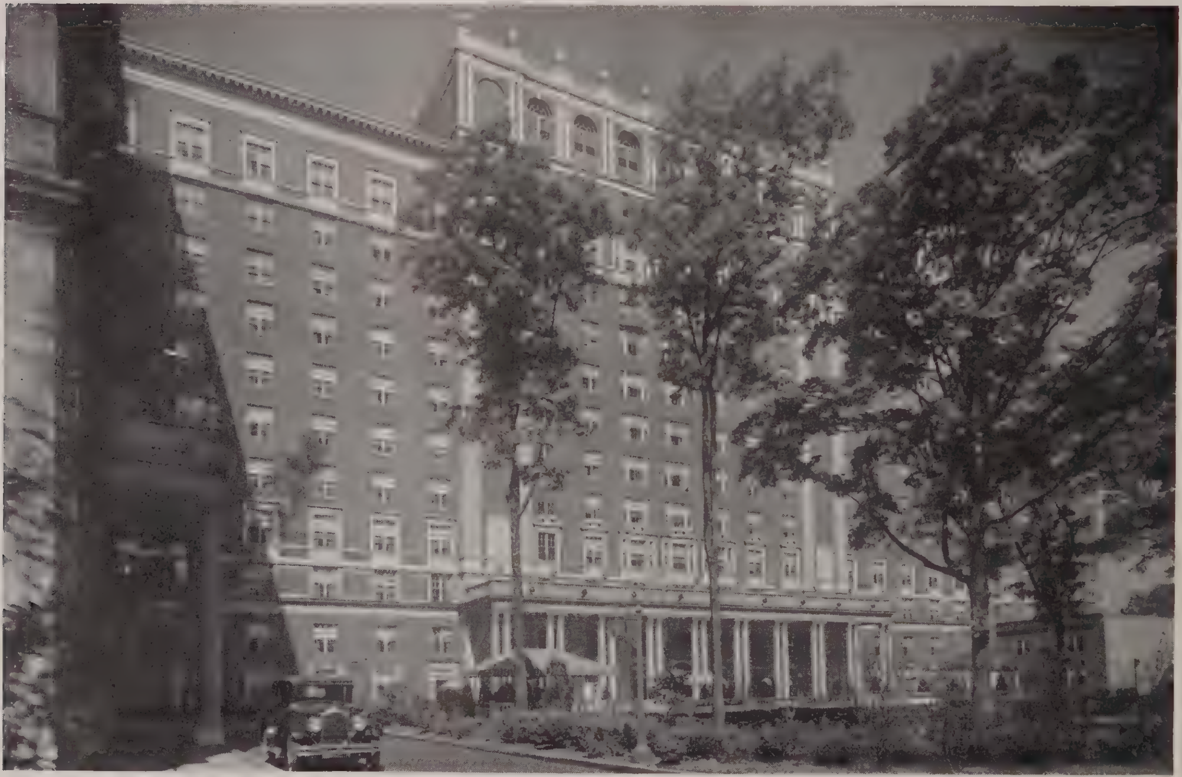


GROUND FLOOR

PLANS, RONEY PLAZA HOTEL, MIAMI BEACH, FLA.
SCHULTZE & WEAVER, ARCHITECTS



ELEVATION ON WEST PEACHTREE STREET

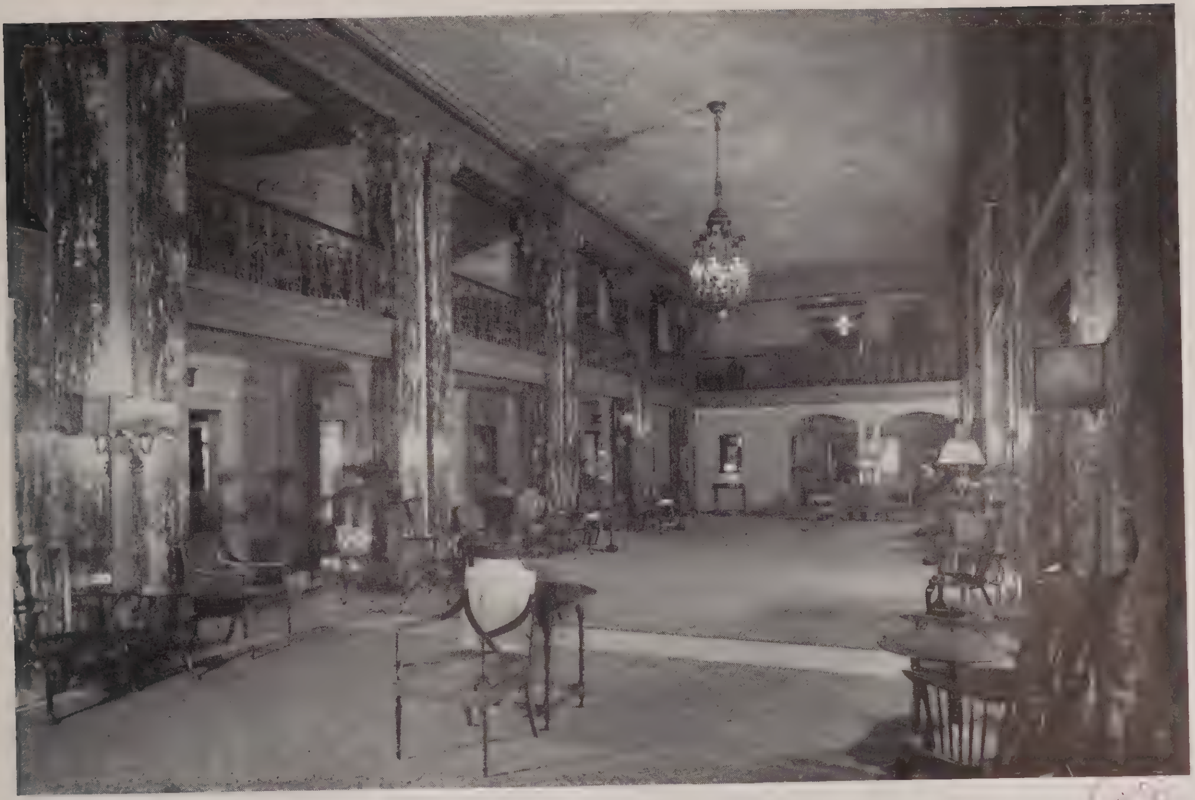


Photos. Amemya

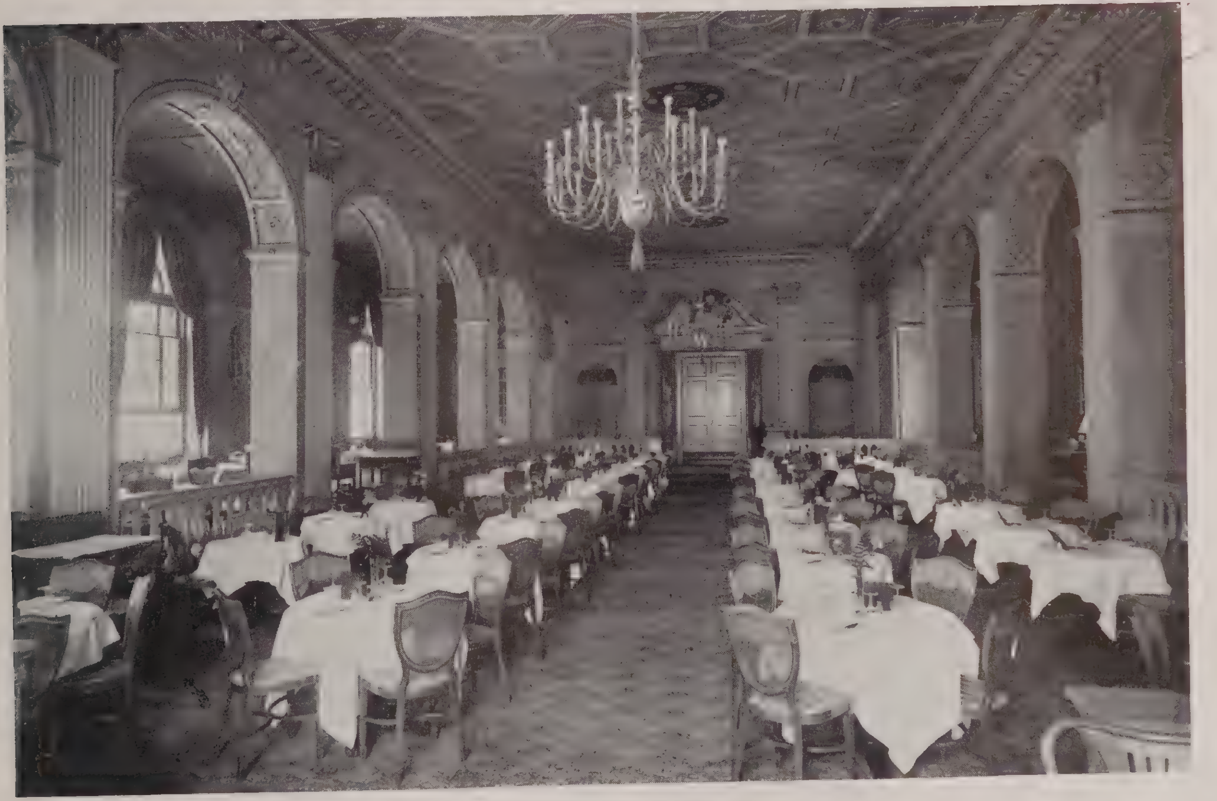
GARDEN FRONT

ATLANTA BILTMORE HOTEL

SCHULTZE & WEAVER, ARCHITECTS



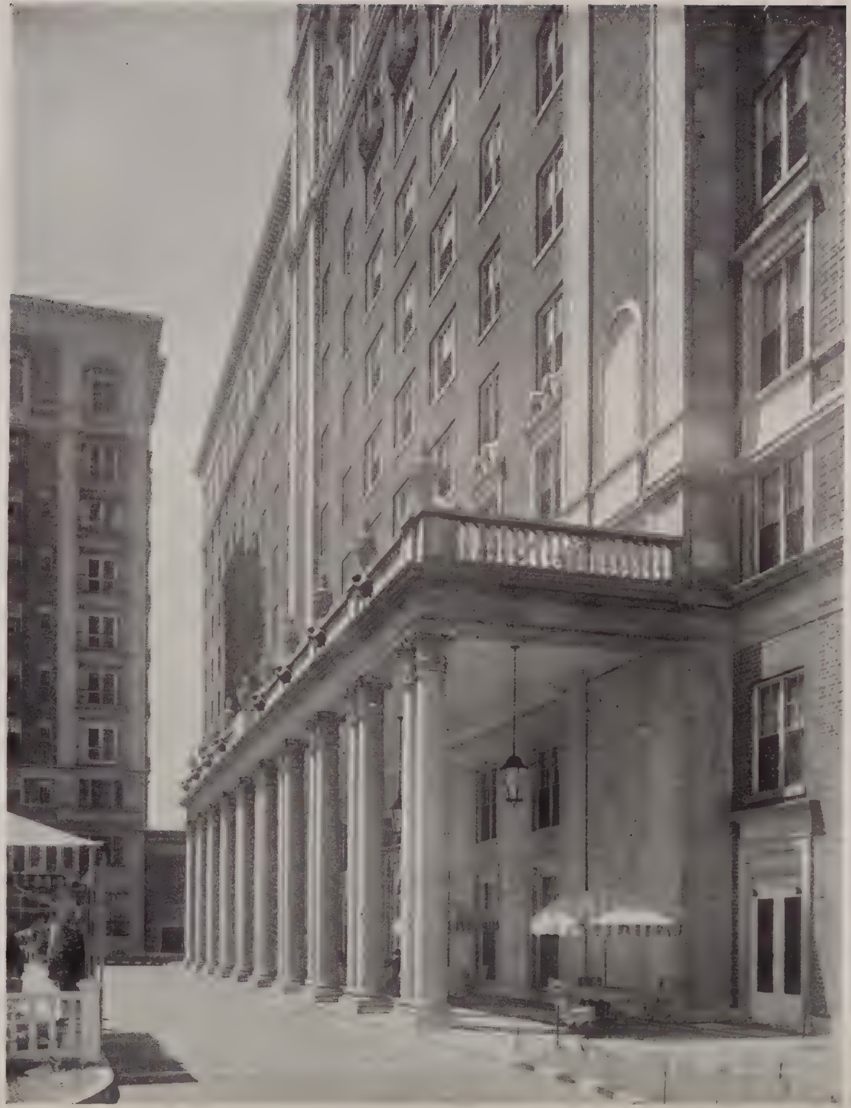
MAIN LOBBY



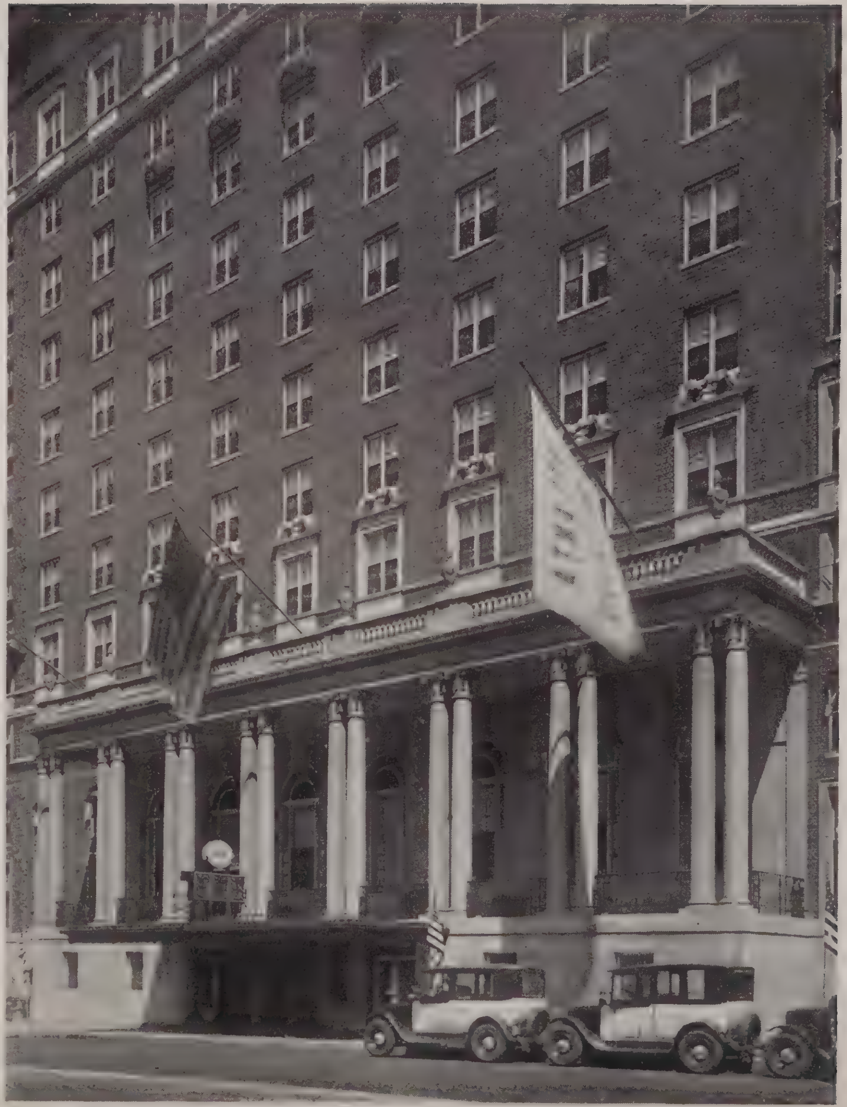
DINING ROOM

ATLANTA BILTMORE HOTEL

SCHULTZE & WEAVER, ARCHITECTS

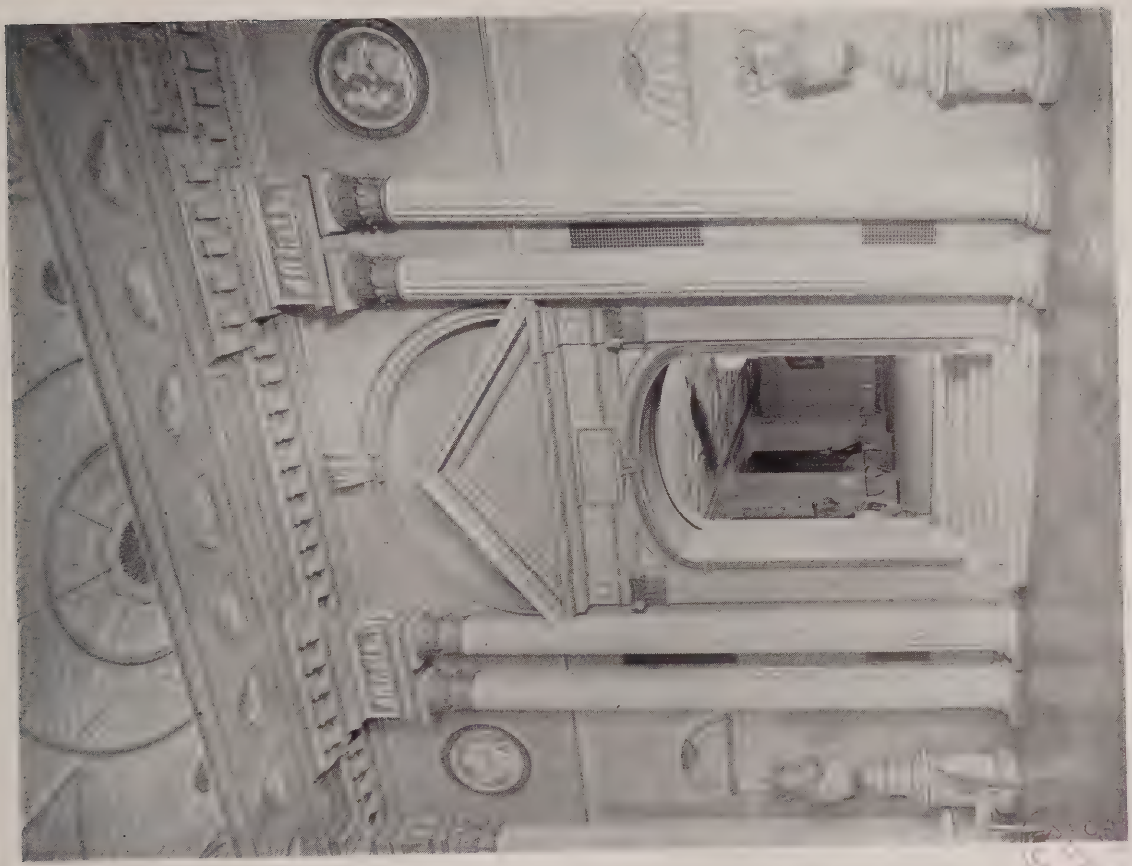


GARDEN PORTICO

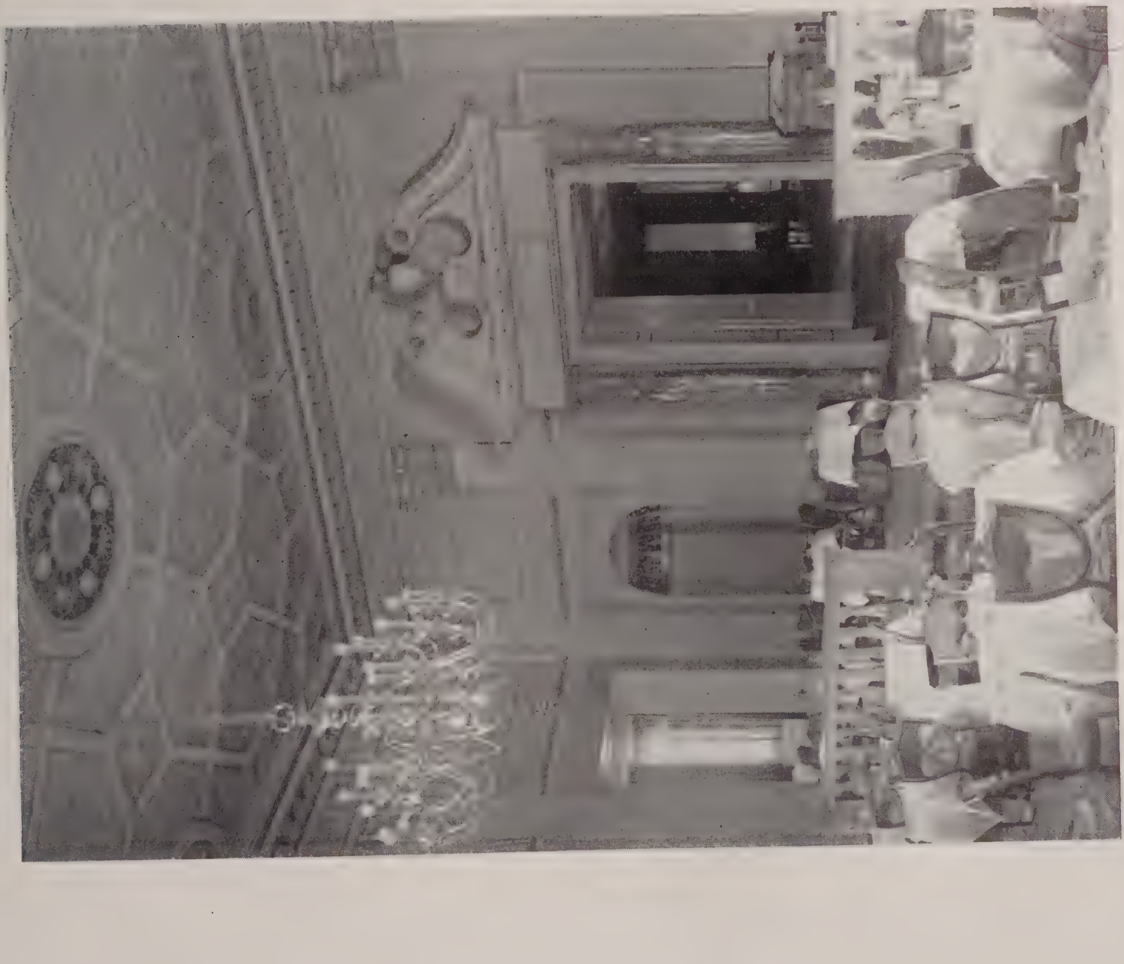


MAIN ENTRANCE

ATLANTA BILTMORE HOTEL
SCHULTZE & WEAVER, ARCHITECTS

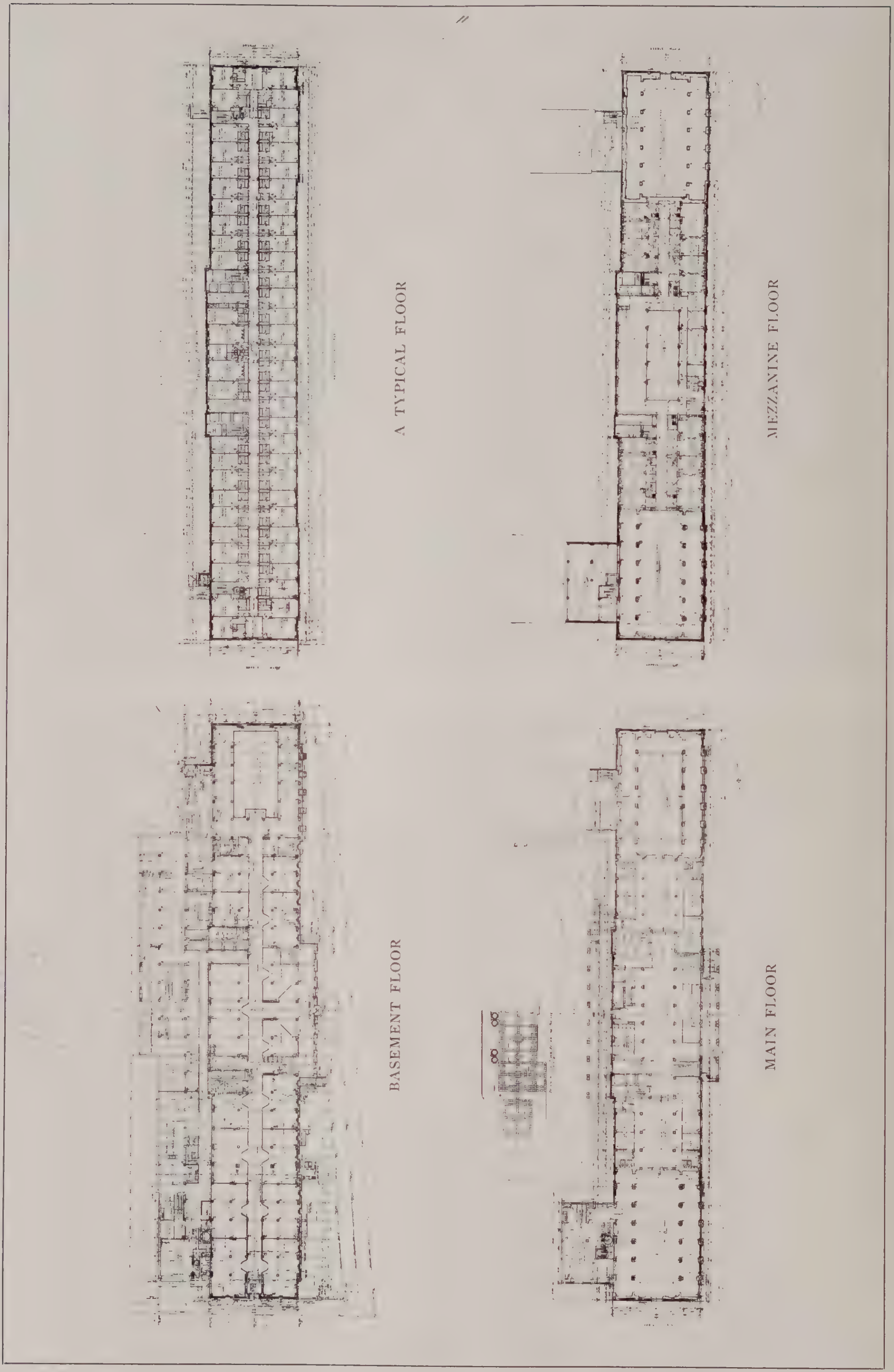


DOORWAY IN BALL ROOM

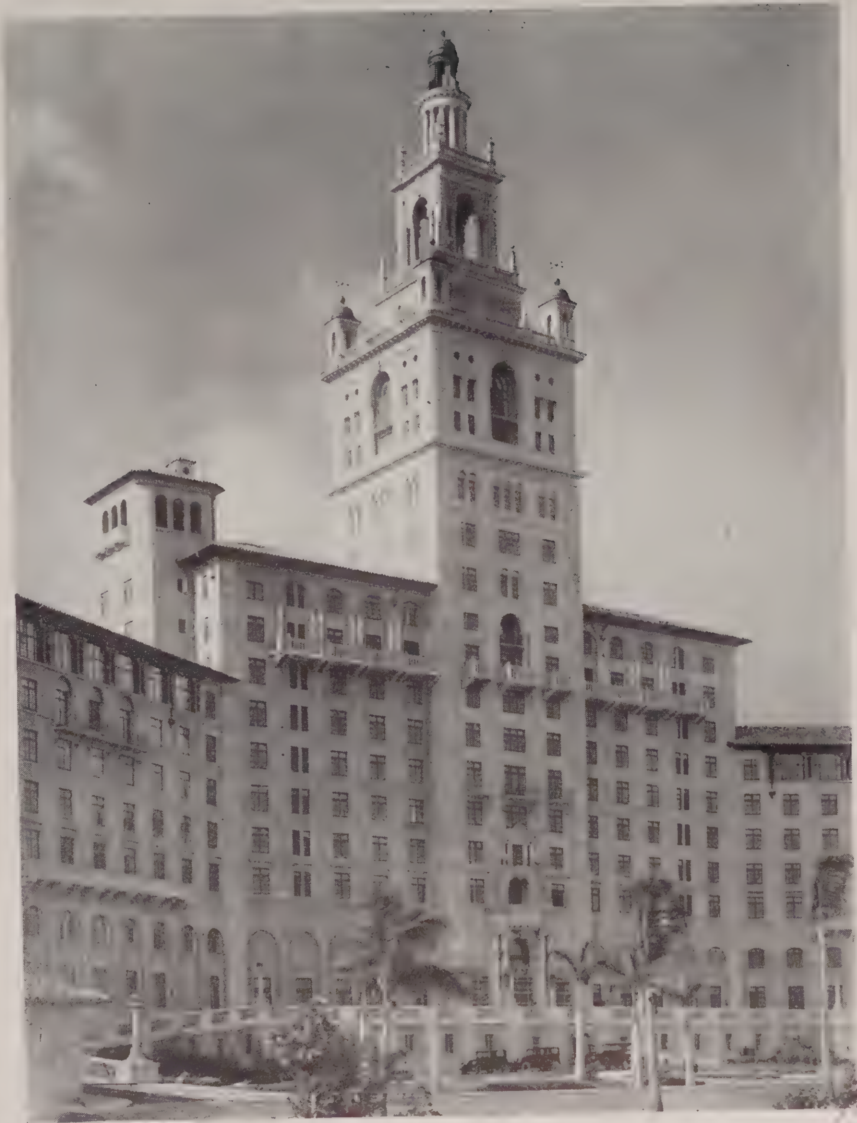


ENTRANCE TO MAIN DINING ROOM

ATLANTA BILTMORE HOTEL
SCHULTZE & WEAVER, ARCHITECTS

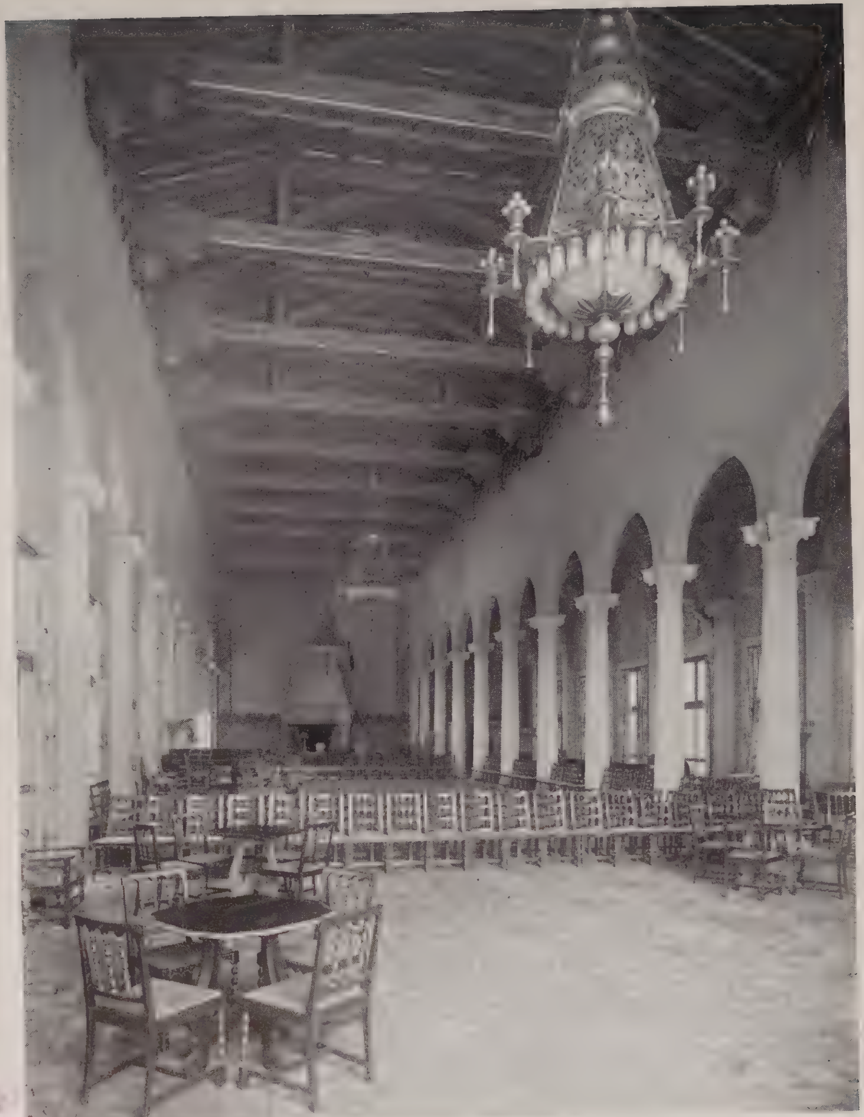


PLANS. ATLANTA BILTMORE HOTEL
SCHULTZE & WEAVER, ARCHITECTS



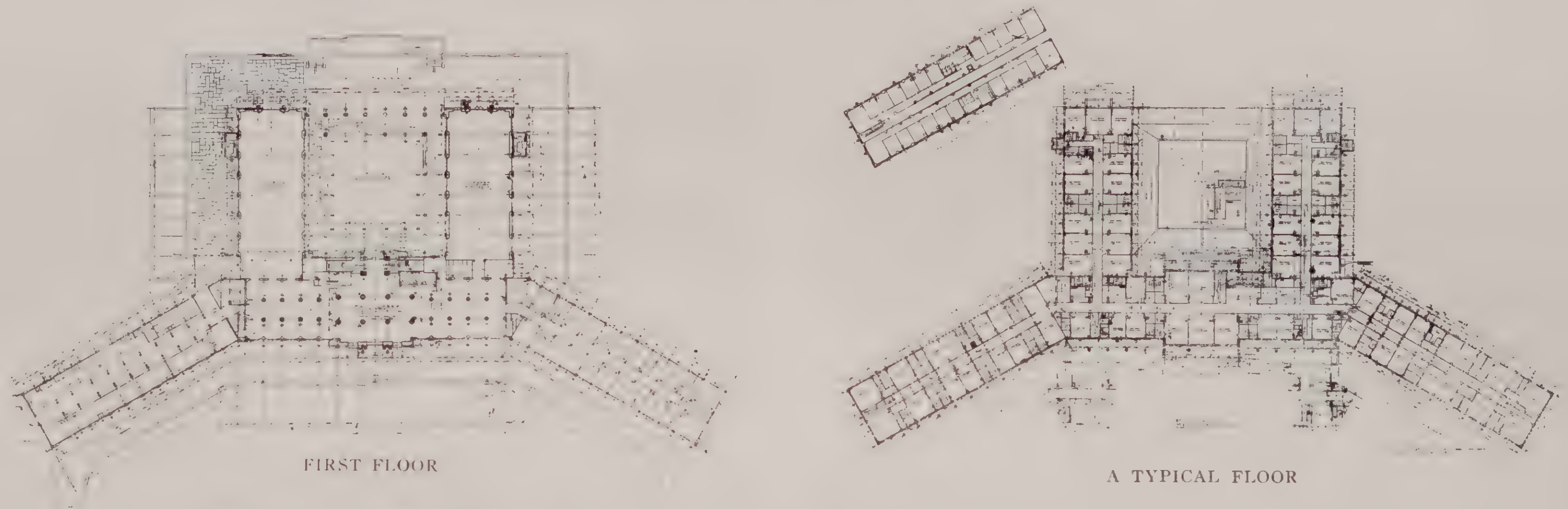
Photos. Amemya

ENTRANCE FRONT



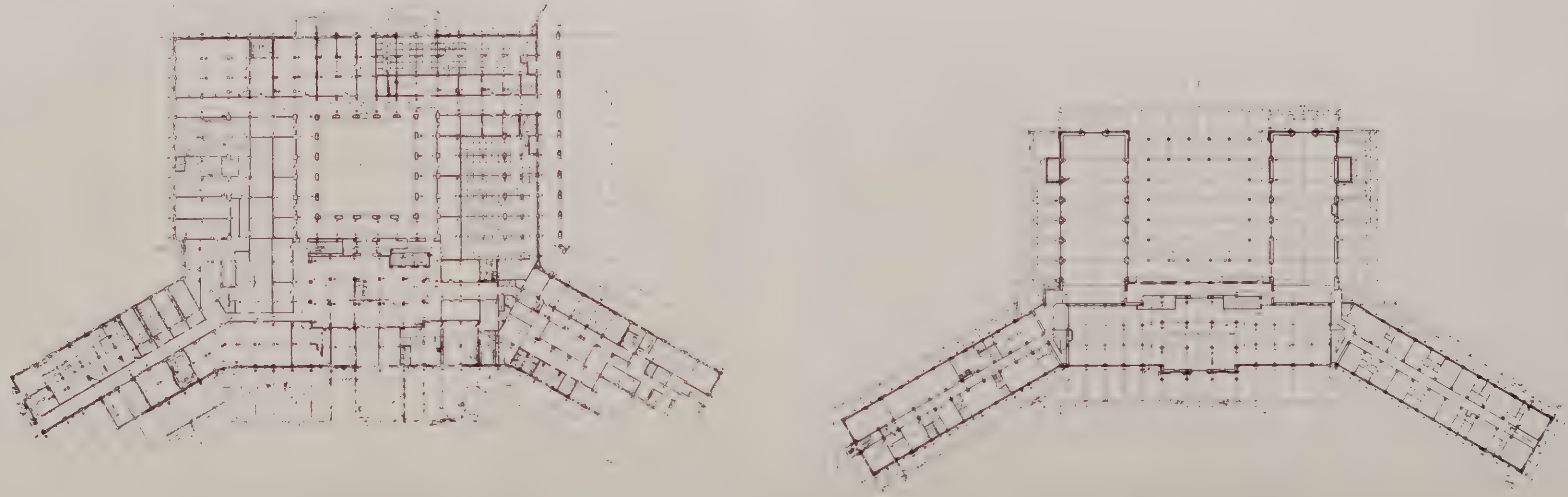
MAIN LOBBY

MIAMI BILTMORE HOTEL, CORAL GABLES, FLA.
SCHULTZE & WEAVER, ARCHITECTS



FIRST FLOOR

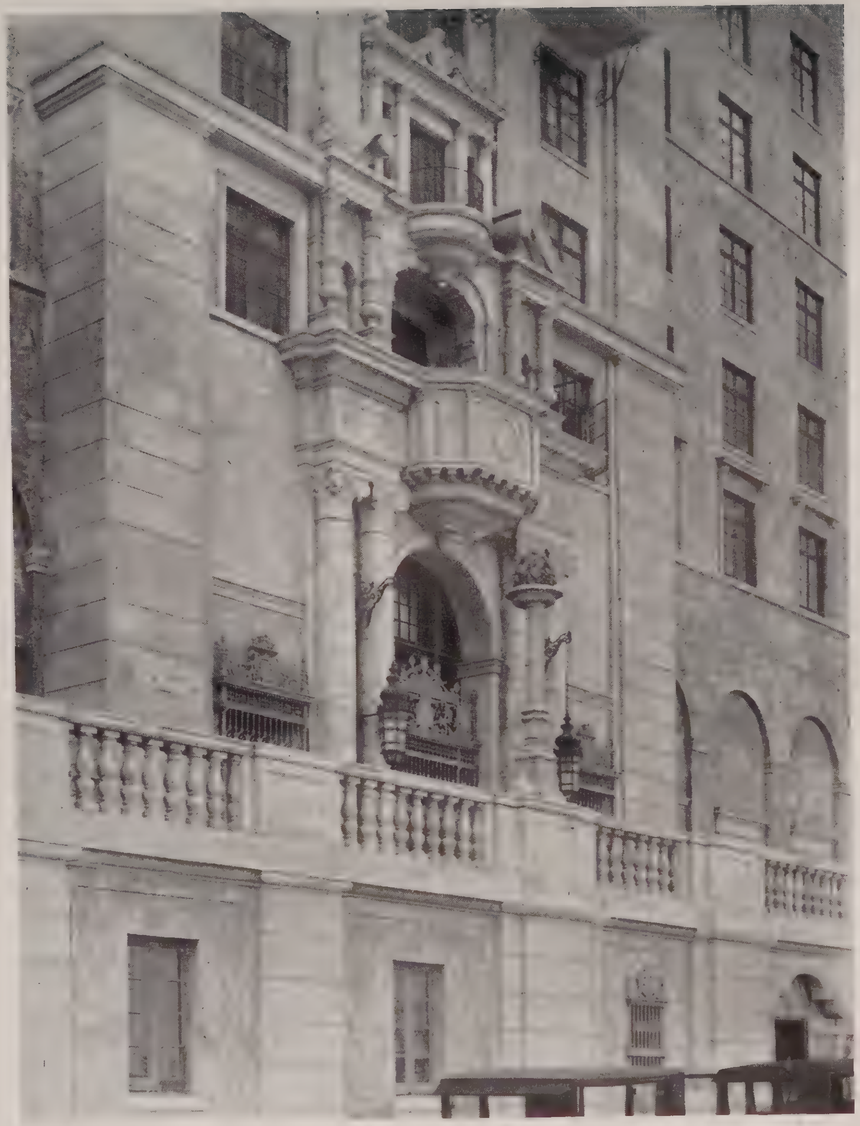
A TYPICAL FLOOR



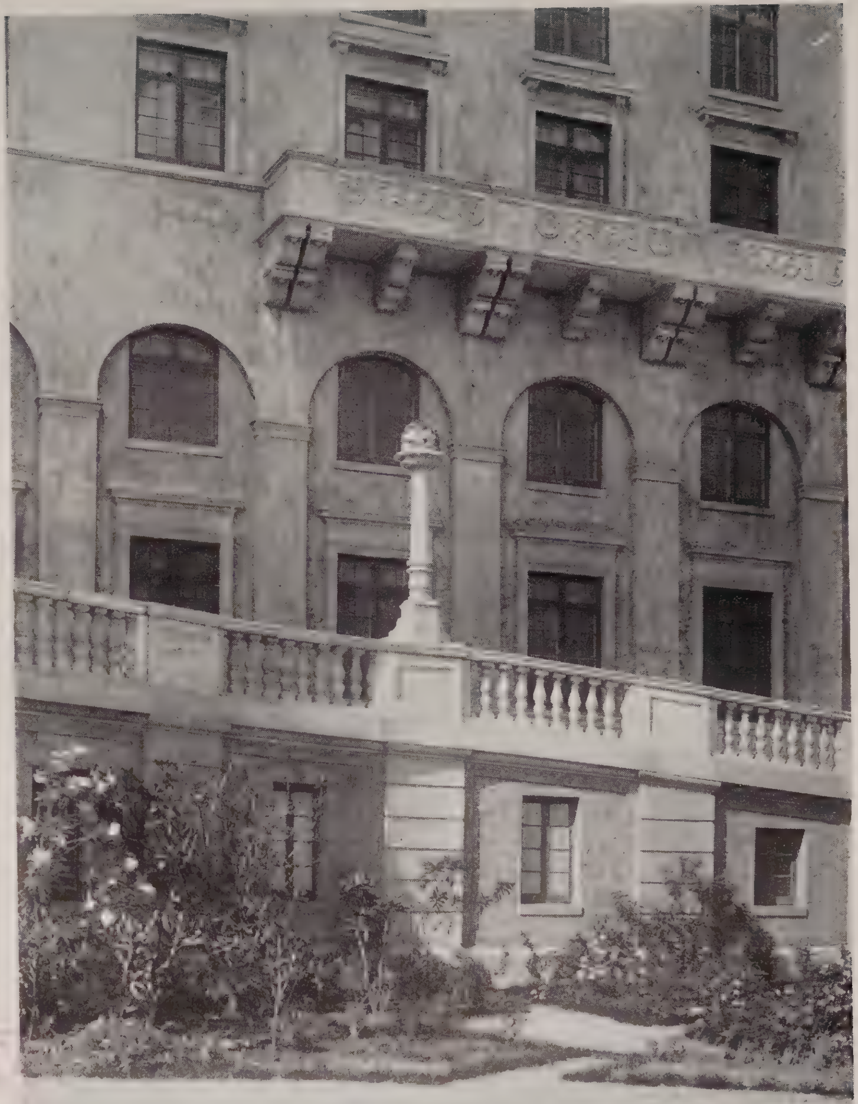
GROUND FLOOR

MEZZANINE FLOOR

PLANS. MIAMI BILTMORE HOTEL, CORAL GABLES, FLA.
SCHULTZE & WEAVER, ARCHITECTS



MAIN ENTRANCE



RAMP OF ROADWAY

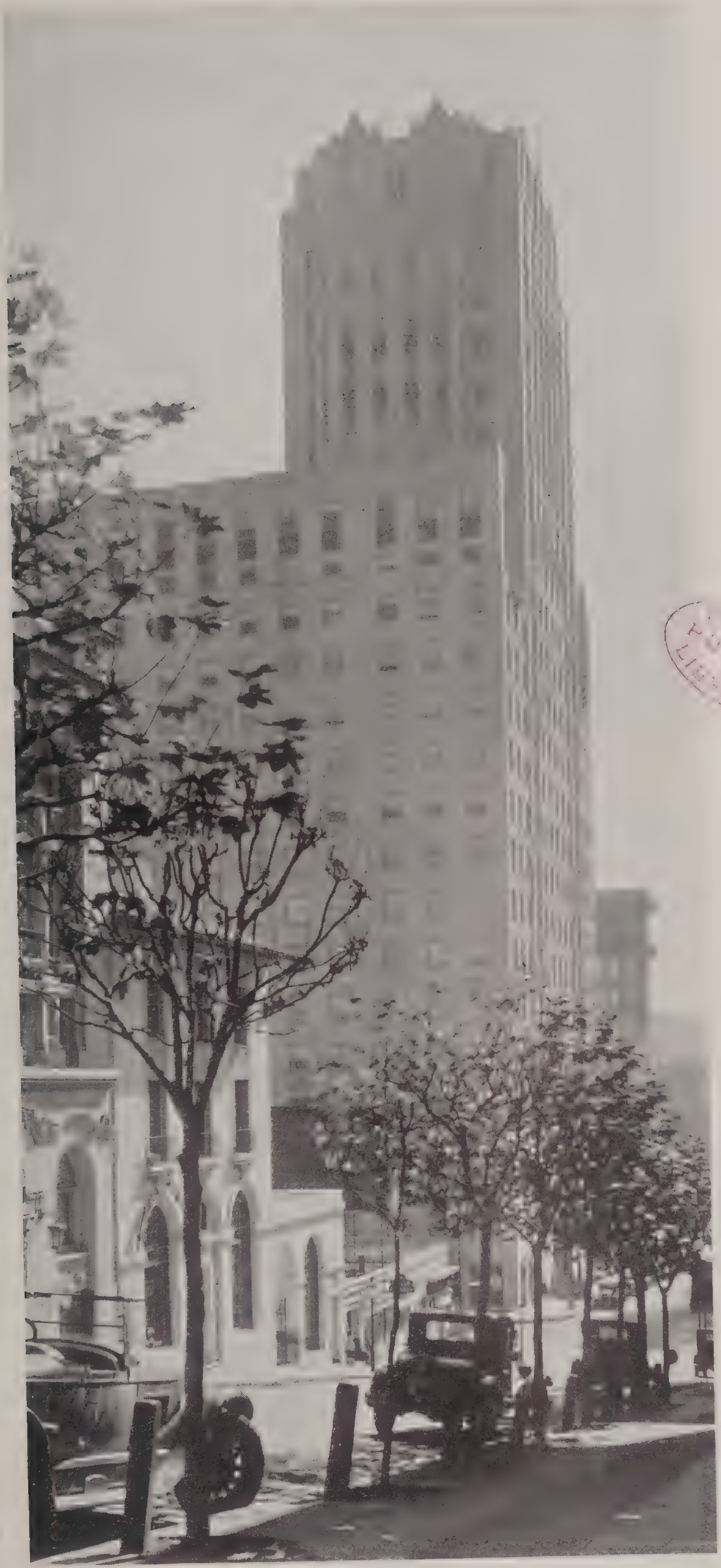
MIAMI BILTMORE HOTEL, CORAL GABLES, FLA.
SCHULTZE & WEAVER, ARCHITECTS

Ocean Front, Miami Biltmore Hotel, Coral Gables, Fla.
Schultze & Weaver, Architects

stories up and 20 stories down, thus avoiding a 40-story elevator run from the basement. Another kitchen will serve the main and private dining rooms and the large and small ball rooms.

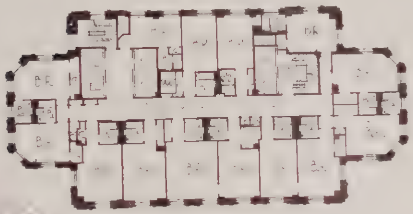
Typical room floors have been laid out with the greatest possible flexibility in the way of combinations in suites. And as a means of giving greater floor space, built-in furniture will take the place of the customary bureau, chiffonier and dressing table. The beds, a few chairs and a writing desk will then be all that are necessary. Everything will be simple, attractive, efficient and conserving of space. The same principle was worked out in the Hotel Lexington, recently opened in New York. There is a definite stylization, here, a free rendering of the Italian Romanesque in the exterior design which carries into the entrance lobby and makes it in this sense a part of the exterior design. Otherwise style has been a point of departure rather than an objective, and many distinctly modern notes, as in the lighting fixtures, give a keynote that links old and new in a logically rationalized expression of the best in both. The same principle has been carried out in the bedroom suites, where the living rooms are furnished with period pieces, mostly Georgian, and the bedrooms with specially designed sets that represent a carefully restrained version of the modern mode. This is particularly true in the main lobby of the hotel, which is distinctly Italian in design and furnishings, carried out with a refreshing freedom of conception. The great center chandelier of this room shows in a splendid manner the modern influence on lighting fixtures.

The idea I really want to express here is my feeling that the new hotel, any more than any other important building of our times, does not need to create overnight a whole new heaven and earth. It would be very unfortunate if it did attempt to do this, and the result would inevitably be an architectural fiasco on a large scale. Styles must be given time to evolve, to adjust themselves to the taste of a period, not to that of a single year. True design cannot be synthetic, nor can it be transplanted. The gradual fusion of one style, one kind of taste with another is a matter of development. It takes time. No good comes of impatience to achieve something entirely new and different,—in architecture particularly. Chesterton was impressed by the permanency of architecture when he said that if you do not like a poem you have written, you can tear it up; or if the picture you have painted is disappointing, you can turn its face to the wall;—but that neither can possibly be done with a city hall or a cathedral.

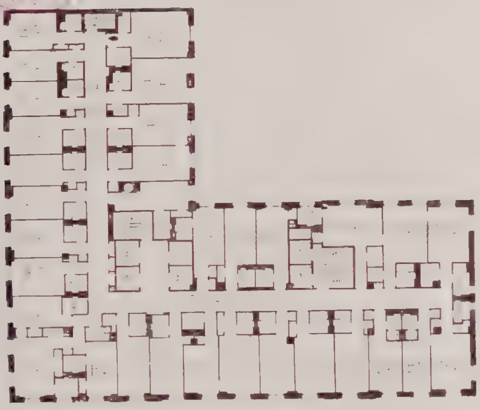


View from Side Street

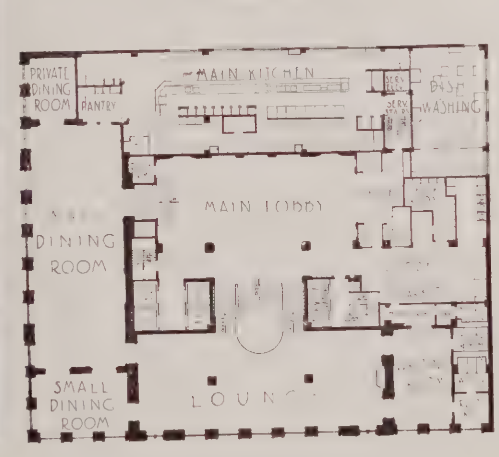
THE Sir Francis Drake Hotel has 494 guest rooms and 460 baths. The capacity of the dining rooms is 644. The building is of steel frame and concrete fireproofing construction, exterior is of brick and terra cotta; interior walls are of plaster on tile and concrete partitions. Public spaces have marble and wood floors. Guest rooms and corridors have carpet over concrete. Windows are double-hung, wood frames in the guest rooms and metal frames in public rooms.



A Tower Floor



A Typical Floor



Second Floor Plan

Sir Francis Drake Hotel, San Francisco

Weeks & Day, Architects

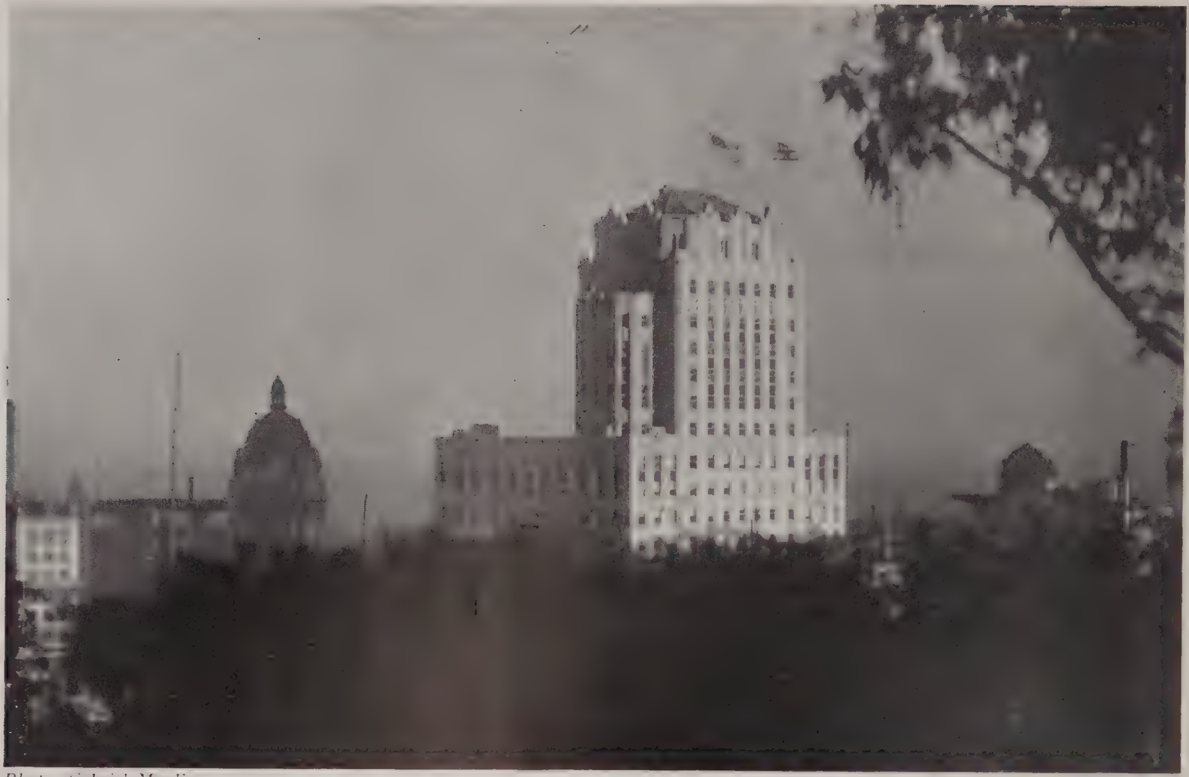


Photo. Gabriel Moulin

VIEW FROM NOB HILL

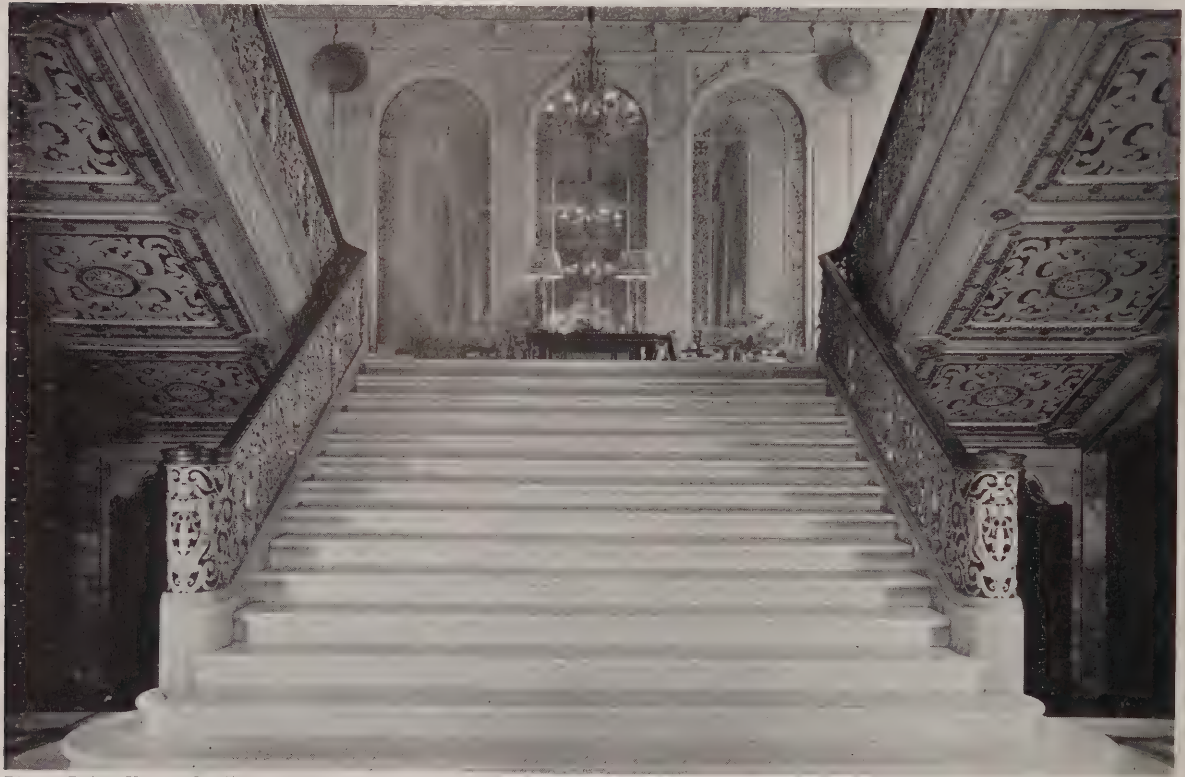
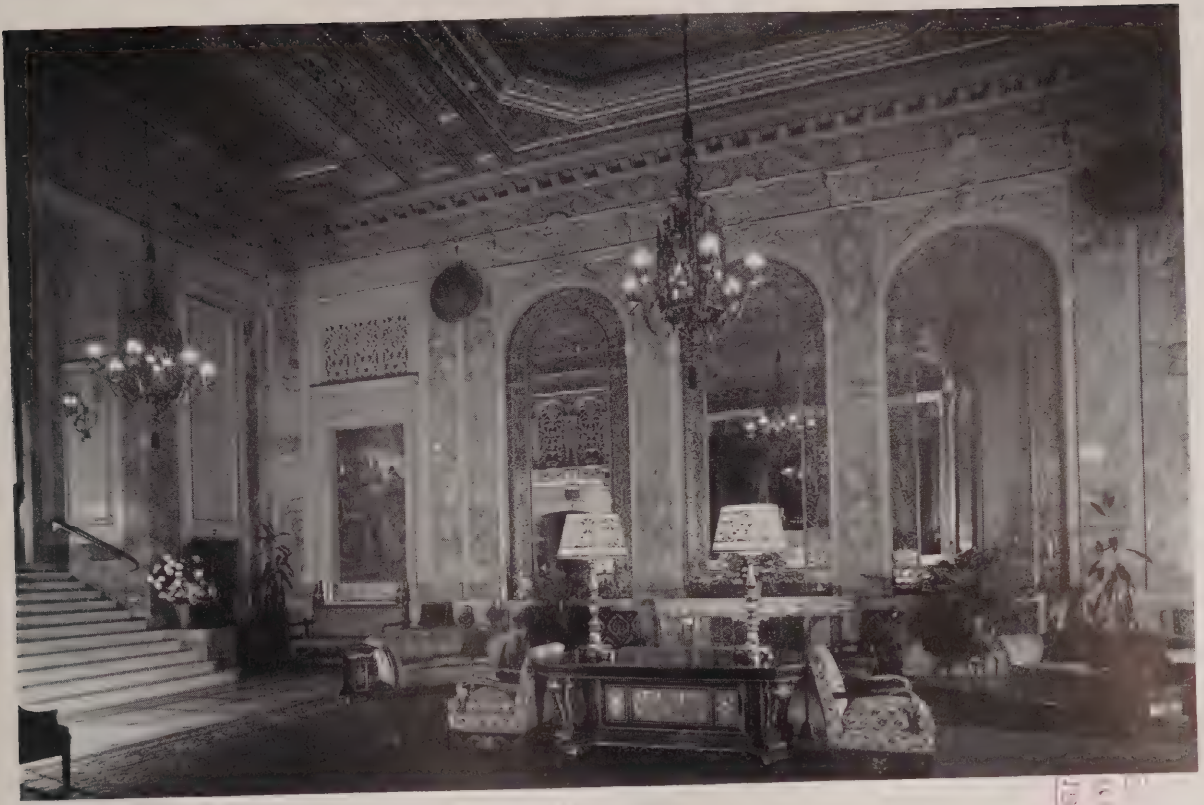


Photo. Ralph Young Studios

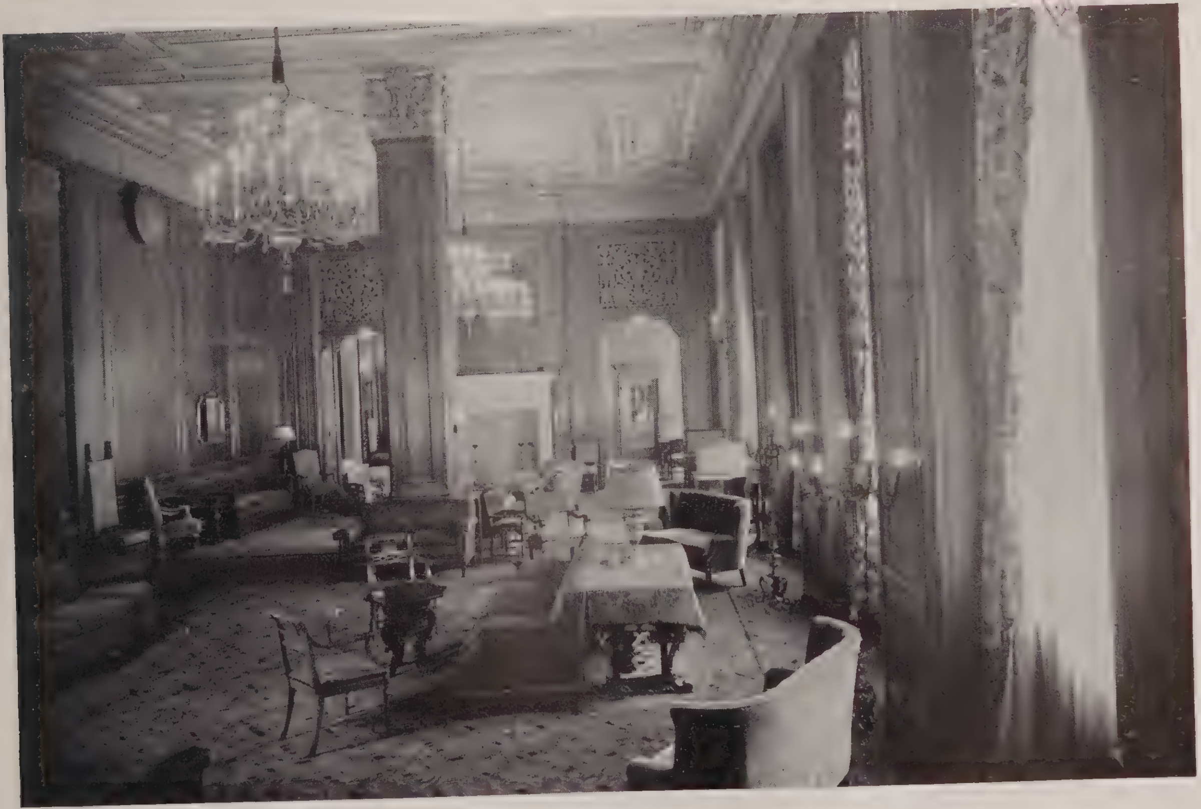
GRAND STAIRCASE

SIR FRANCIS DRAKE HOTEL, SAN FRANCISCO

WEEKS & DAY, ARCHITECTS



MAIN LOBBY

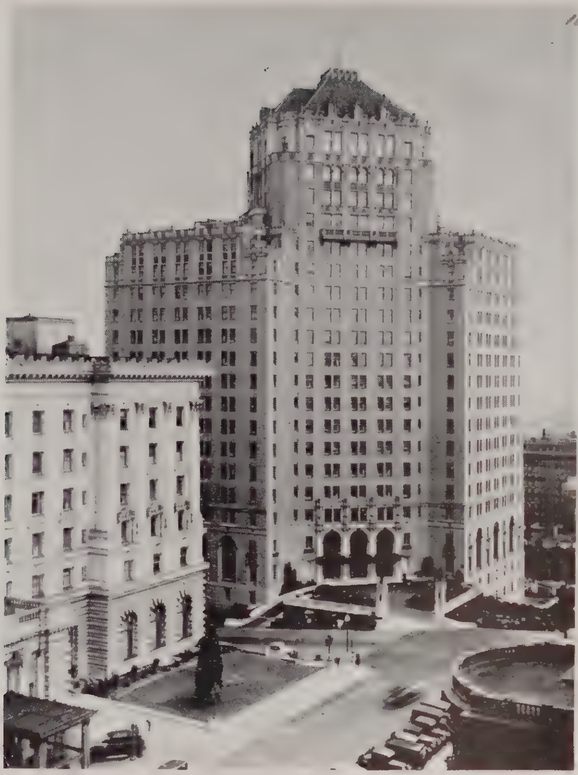


Photos. Ralph Young Studios

LOUNGE

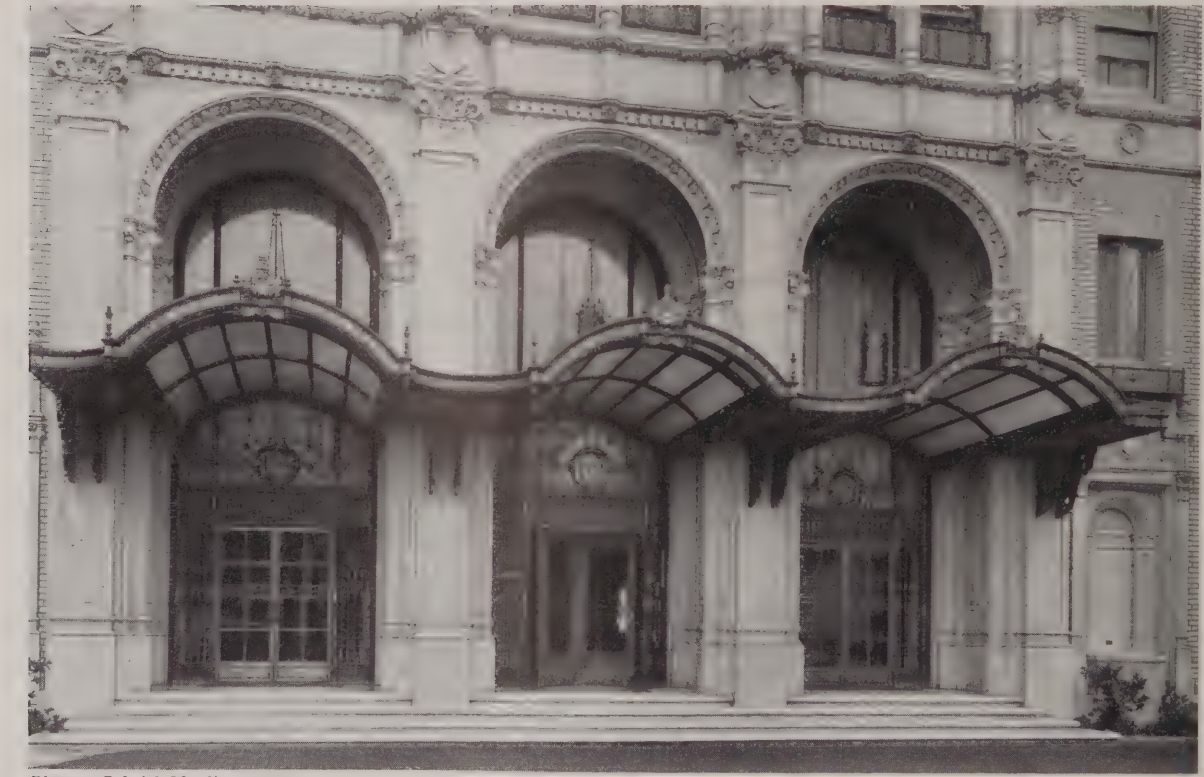
SIR FRANCIS DRAKE HOTEL, SAN FRANCISCO

WEEKS & DAY, ARCHITECTS



General View

TWO years older than the Sir Francis Drake Hotel, less of the modern spirit is found in the exterior design and interior decoration of the Mark Hopkins Hotel. It possesses an interesting plan cleverly worked out to fit a hillside location, and has a corner entrance. It is slightly smaller in size than the Sir Francis Drake, but it also caters to an exclusive clientele. The interior furnishings and decorations as well as the architecture are simpler in character and rather more Italian in feeling. The suggestion of Italian inspiration is clearly evident in the arcaded windows of the dining room, the painted beam ceiling in the lobby, and the wall and ceiling decorations in the grill room. The ball room, otherwise known as the "Room of the Dons," on account of the mural paintings above its high paneled wainscoting, is a very colorful and interesting room. It is refreshing to find so vigorous and unusual a decorative treatment for a ball room. In the Sir Francis Drake the interior architecture and decorations are richer and more elaborate. Marble covered and paneled walls are found in most of the public rooms. The treatment of the main lobby and staircase suggests a free adaptation of the architectural decoration of the Francis I period. The complete dissimilarity of the two plans is interesting. In the

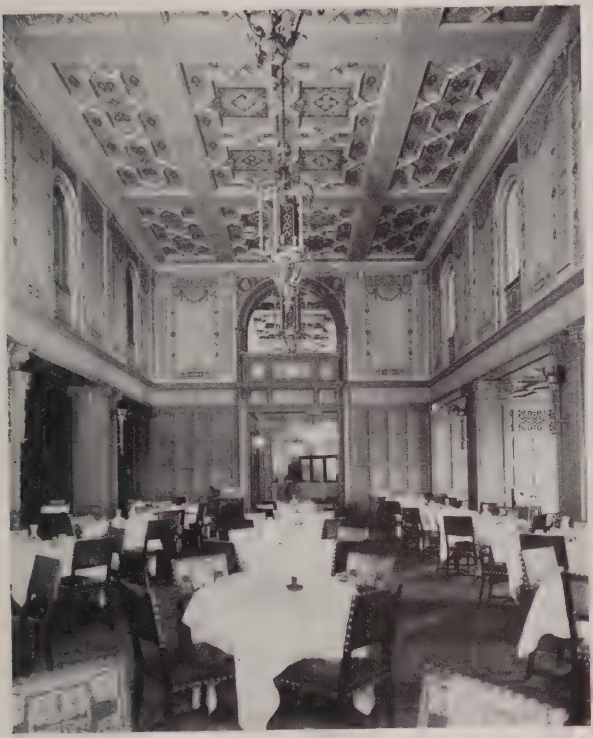


Photos. Gabriel Moulin

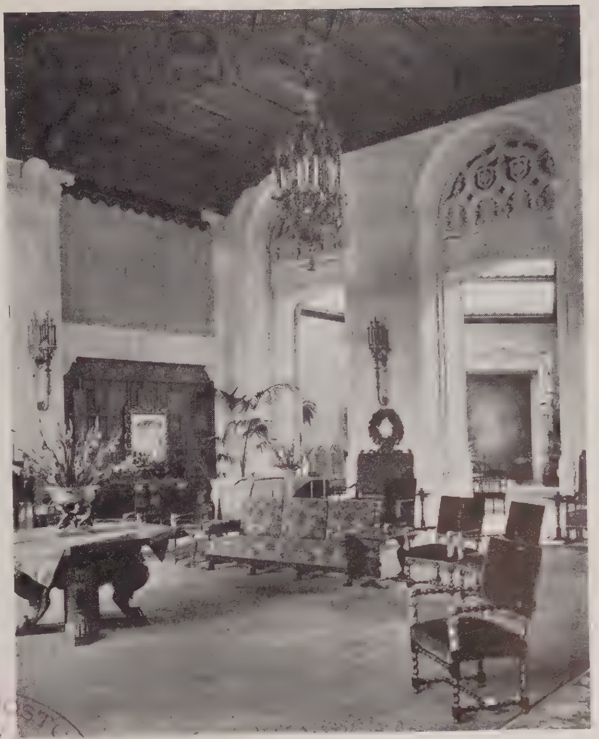
Main Entrance

MARK HOPKINS HOTEL, SAN FRANCISCO

Weeks & Day, Architects

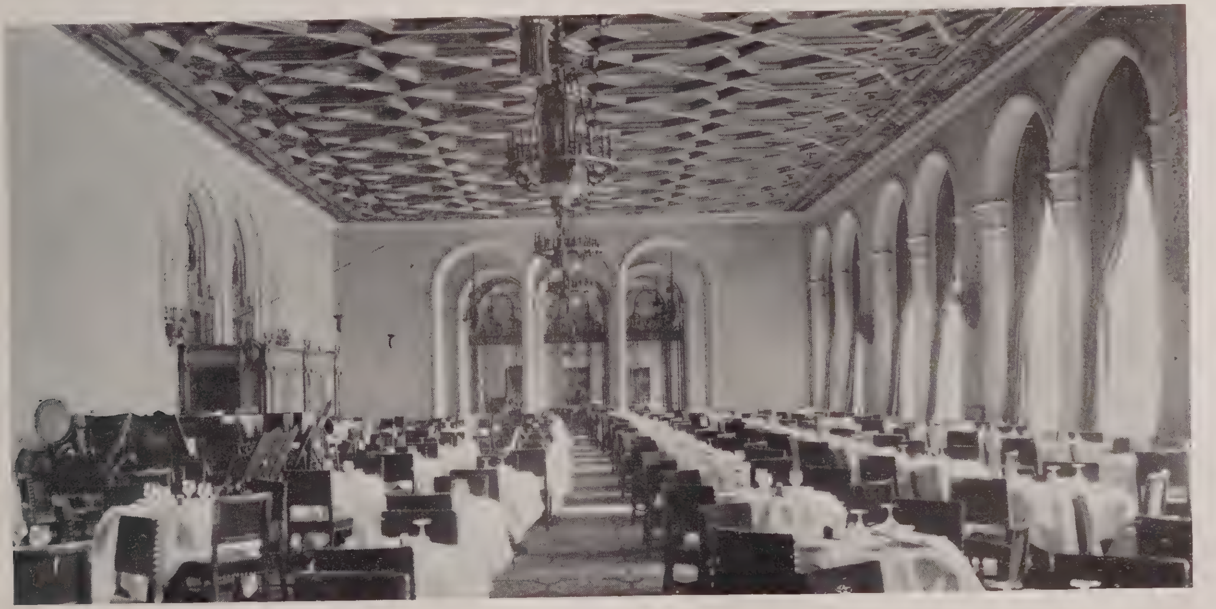


Grill Room



Lobby

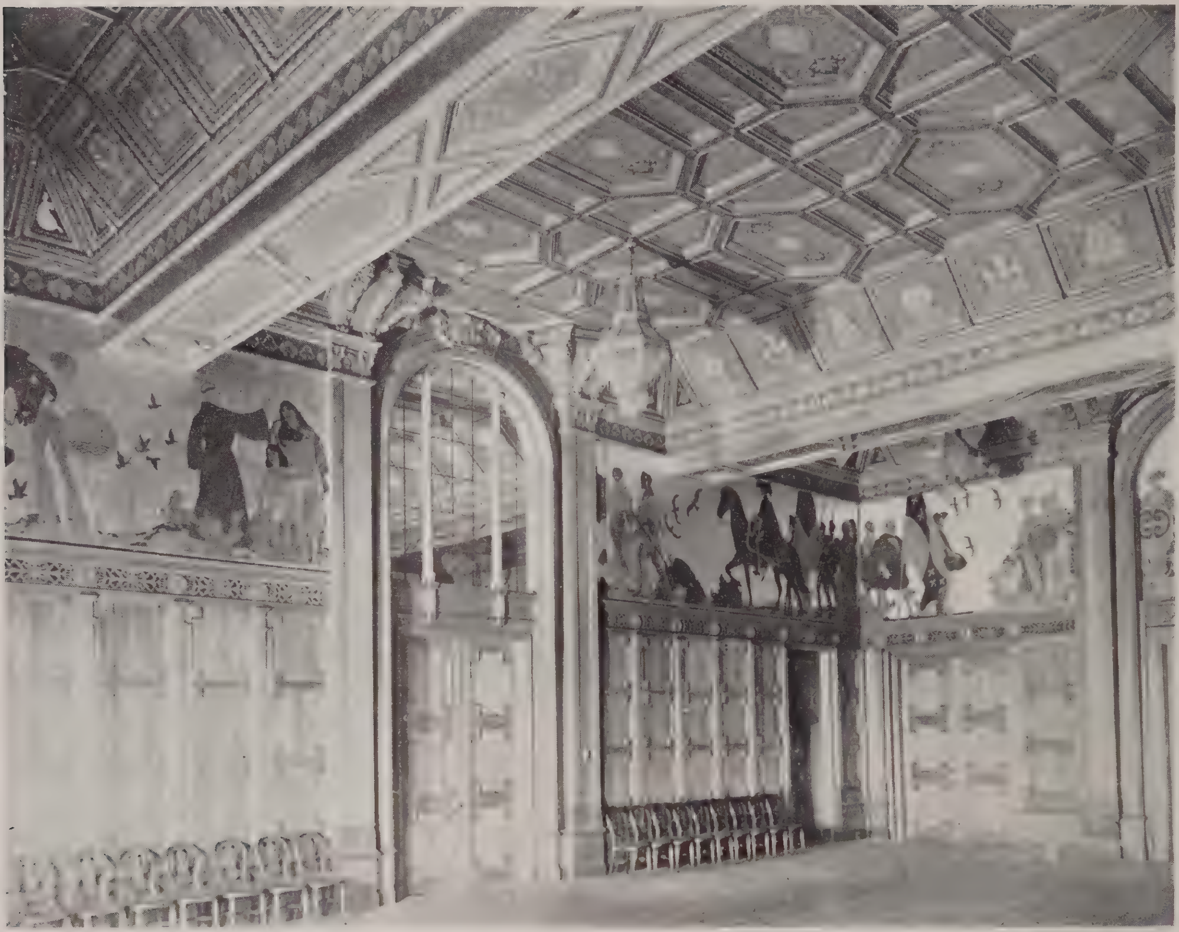
Drake Hotel we find a rectangular plan for the public floors with an L-shaped plan for the majority of the bedroom floors. The plan of the Mark Hopkins Hotel is in the shape of the letter U above the three lower floors. One great advantage in both of these layouts is that all of the bedrooms have outside windows. Weeks & Day, the architects, deserve much credit for the carefully worked out plans and interesting treatment. The two-pipe system of steam heating is used. There is mechanical ventilation in the public spaces, work rooms, basement and all bathrooms. The cubic contents is 3,800,000, the cubic foot cost 55 cents, and the total cost $2,100,000, including fees, but exclusive of furnishings, furniture and kitchen equipment. It was built in 1926.



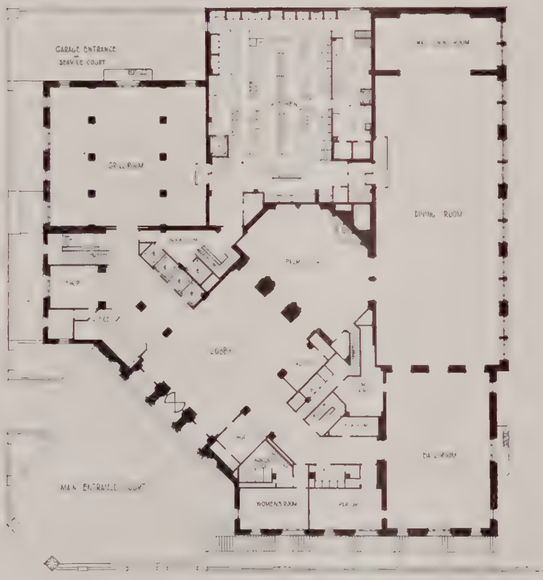
Main Dining Room

MARK HOPKINS HOTEL, SAN FRANCISCO

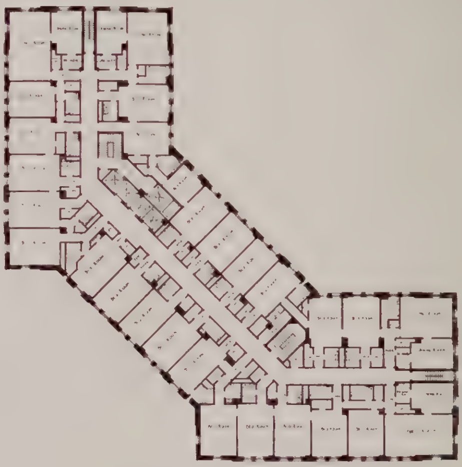
Weeks & Day, Architects



ONE END OF BALL ROOM

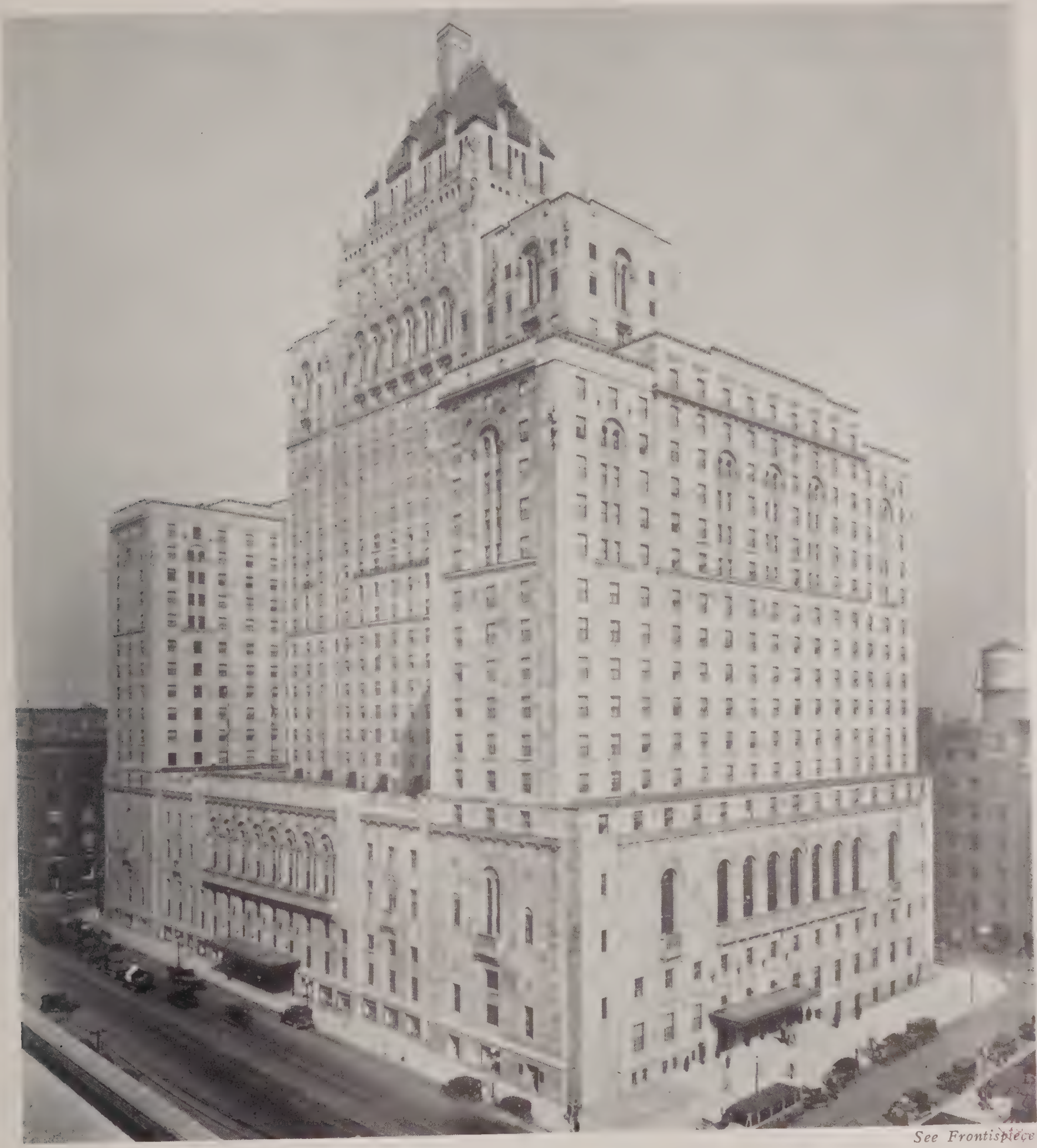


FIRST FLOOR PLAN



A TYPICAL FLOOR PLAN

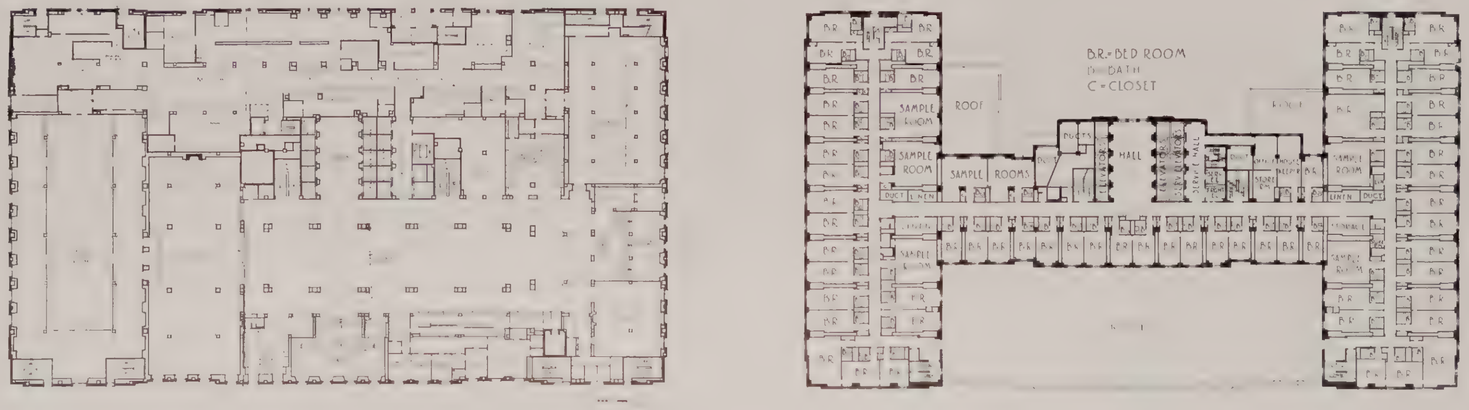
MARK HOPKINS HOTEL, SAN FRANCISCO
WEEKS & DAY, ARCHITECTS



See Frontispiece

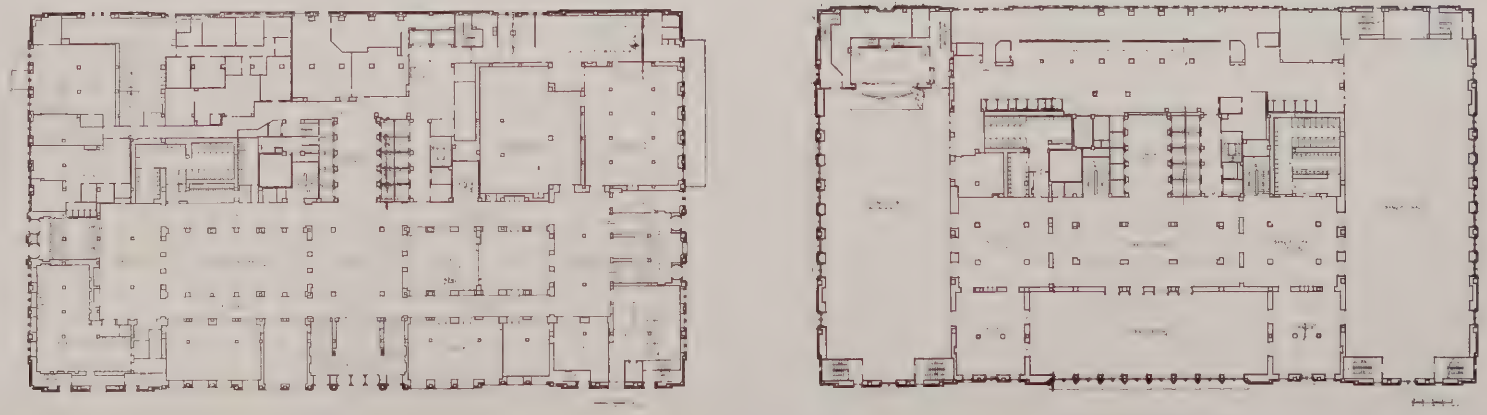
Royal York Hotel, Toronto
Ross & Macdonald, Architects
Sproatt & Rolph, Associated

THE Royal York Hotel, one of the finest in the Dominion of Canada, is the latest addition to the chain of hotels of the Canadian Pacific Railway. It occupies an excellent location, fronting on Lake Ontario. The building is unusually well planned, so that every room is an outside room, providing for a maximum amount of light and air. There are 1,002 guest rooms and 999 baths. The dining rooms accommodate 1,330. The seating capacity of the ball room for a banquet is 650 and for a convention or concert 855. The architectural treatment of the exterior walls, which are of limestone, is simple. Reinforced concrete floors and tile and concrete partitions are used in the interior. The public spaces have marble, tile and terrazzo floors, and the guest rooms, cement, except in the suites where oak parquetry is used. The windows are typical steel and wood, double-hung. There is direct and indirect heating for the public rooms, kitchens, laundry, etc., and direct for the bedrooms. Steam is supplied from an outside central plant nearby.



MAIN FLOOR

A TYPICAL FLOOR

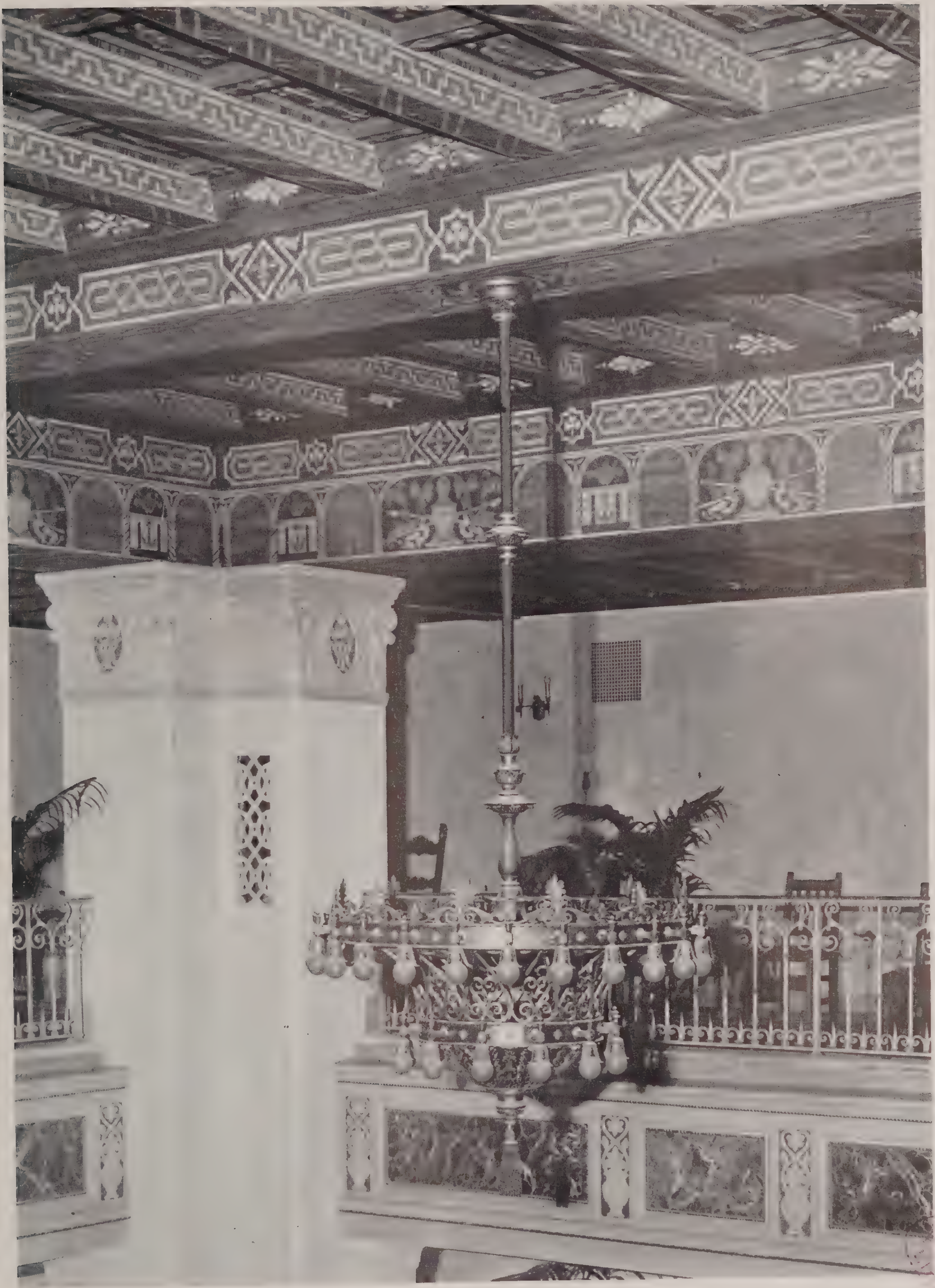


GROUND FLOOR

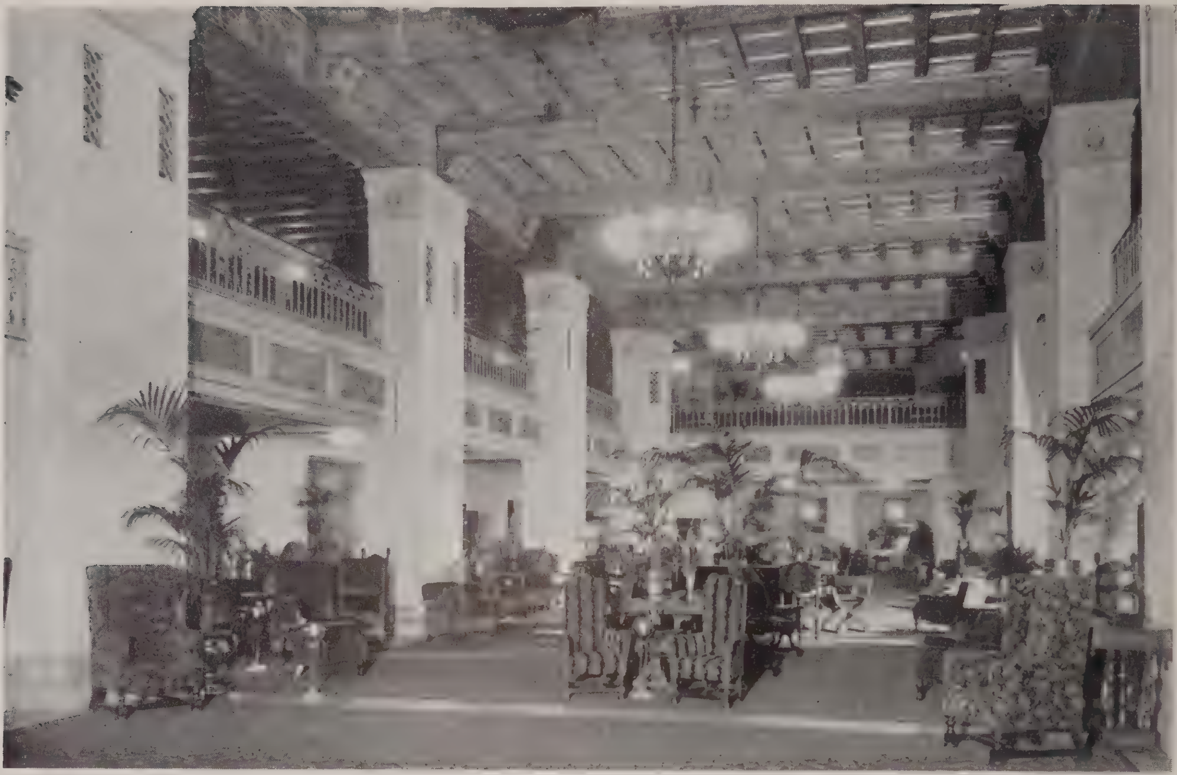
CONVENTION FLOOR

PLANS. ROYAL YORK HOTEL, TORONTO

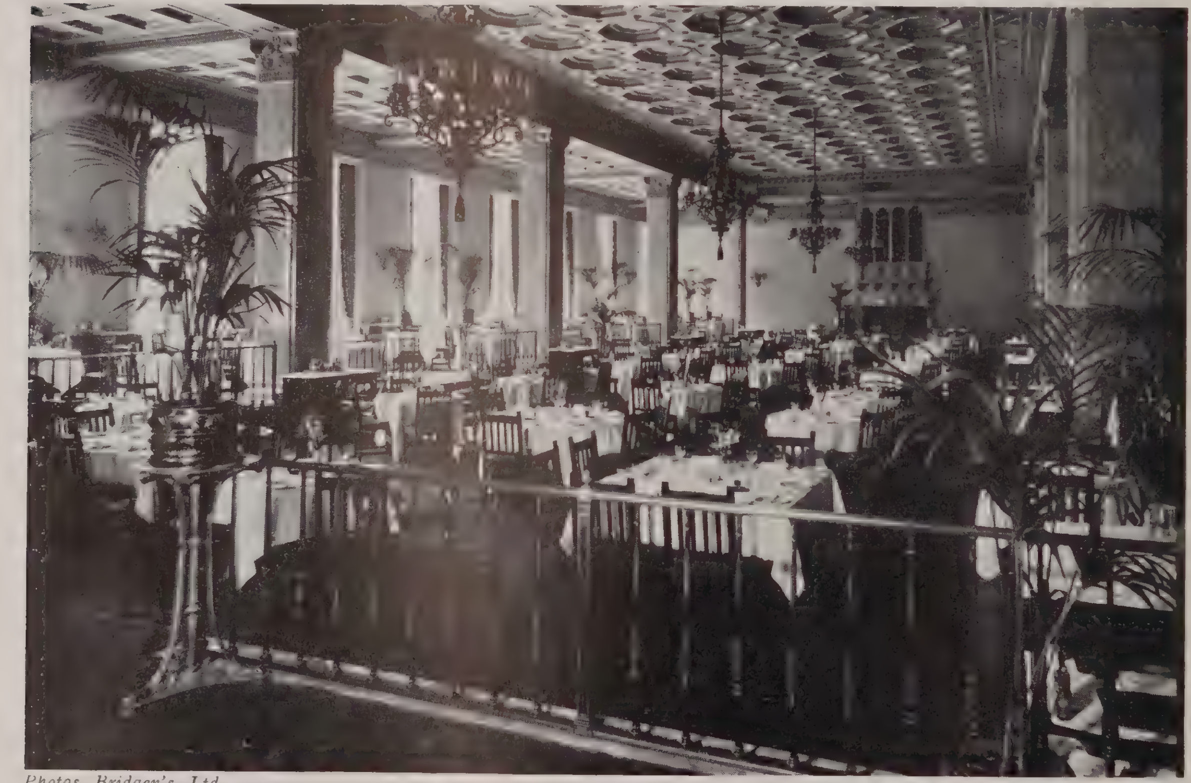
ROSS & MACDONALD, ARCHITECTS; SPROATT & ROLPH, ASSOCIATED



MAIN LOBBY CEILING AND CHANDELIER
ROYAL YORK HOTEL, TORONTO
ROSS & MACDONALD, ARCHITECTS; SPROATT & ROLPH, ASSOCIATED



MAIN LOBBY

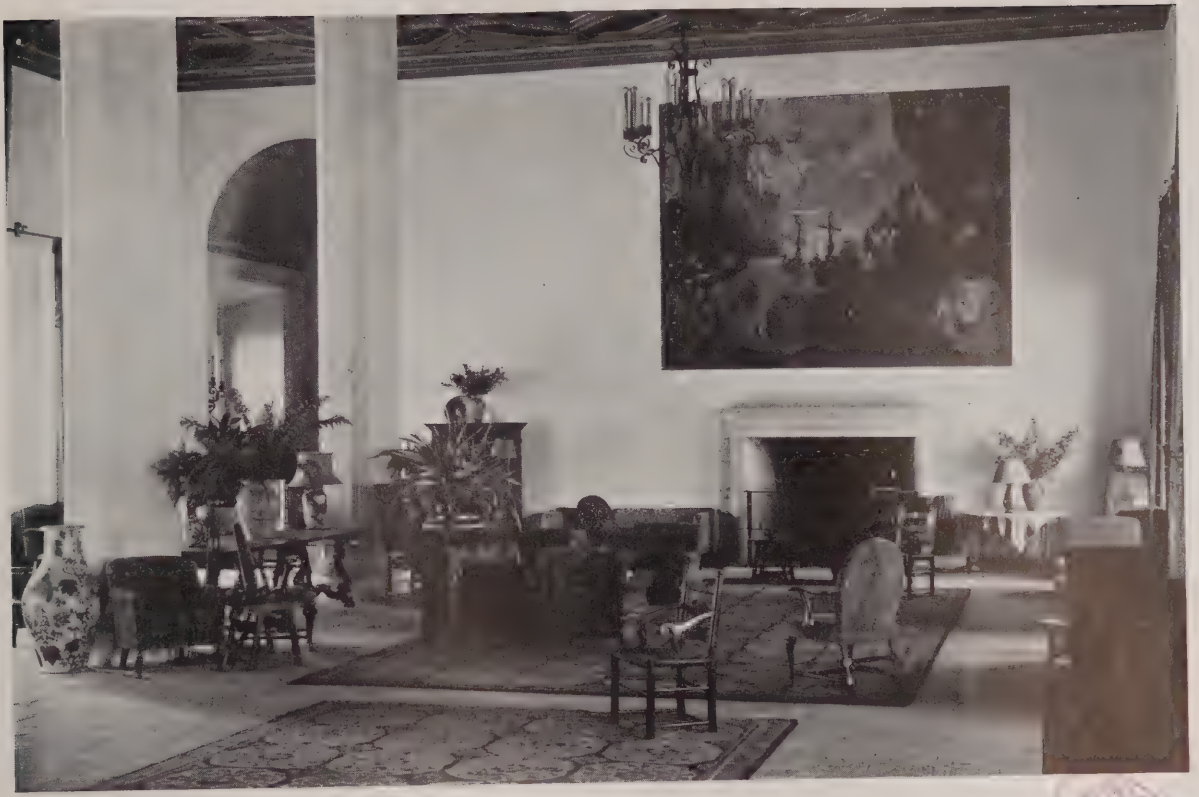


Photos. Bridgen's, Ltd.

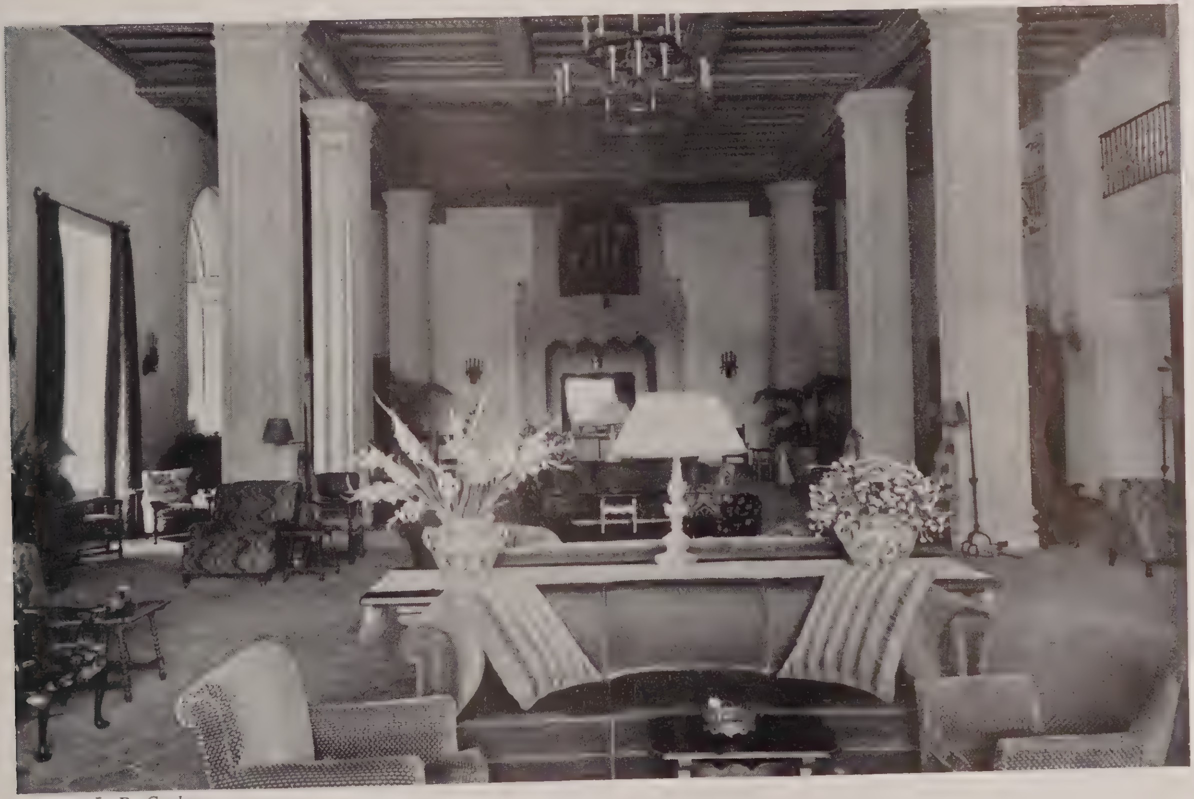
MAIN DINING ROOM

ROYAL YORK HOTEL, TORONTO

ROSS & MACDONALD, ARCHITECTS; SPROATT & ROLPH, ASSOCIATED



LOUNGE

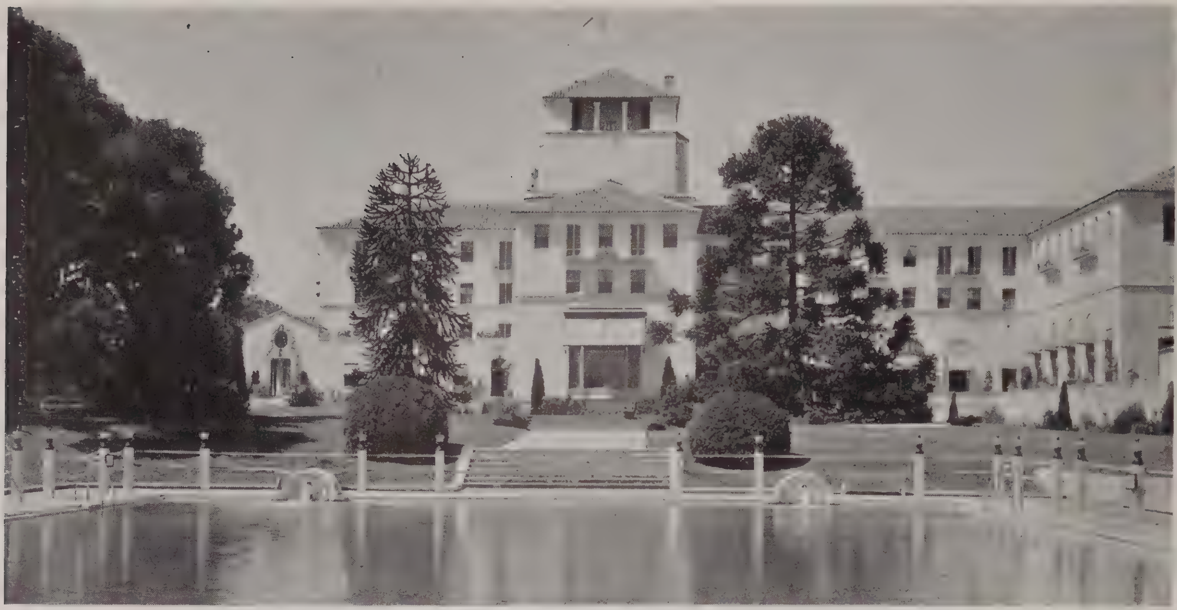


Photos. J. P. Graham

LOBBY

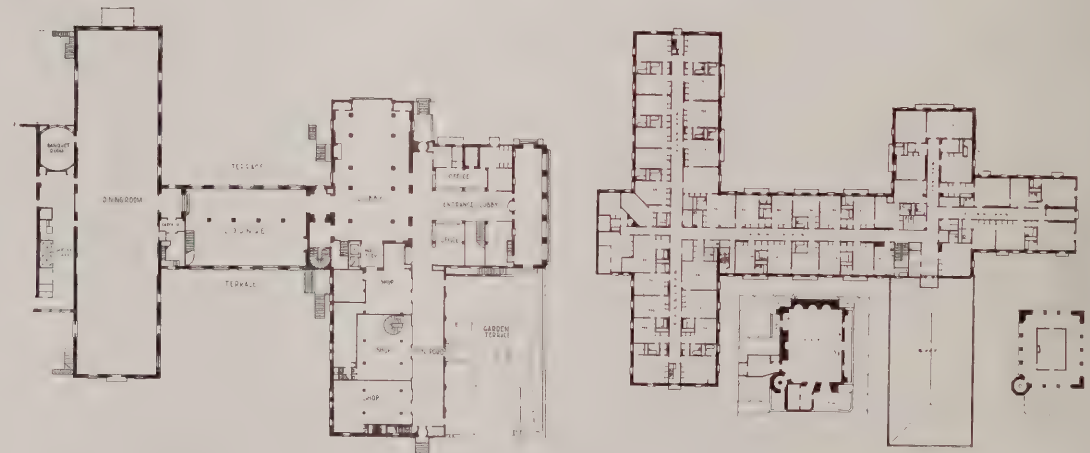
DEL MONTE HOTEL, DEL MONTE, CAL.

LEWIS P. HOBART AND CLARENCE A. TANTAU, ARCHITECTS



A General View of One of the Wings from Swimming Pool

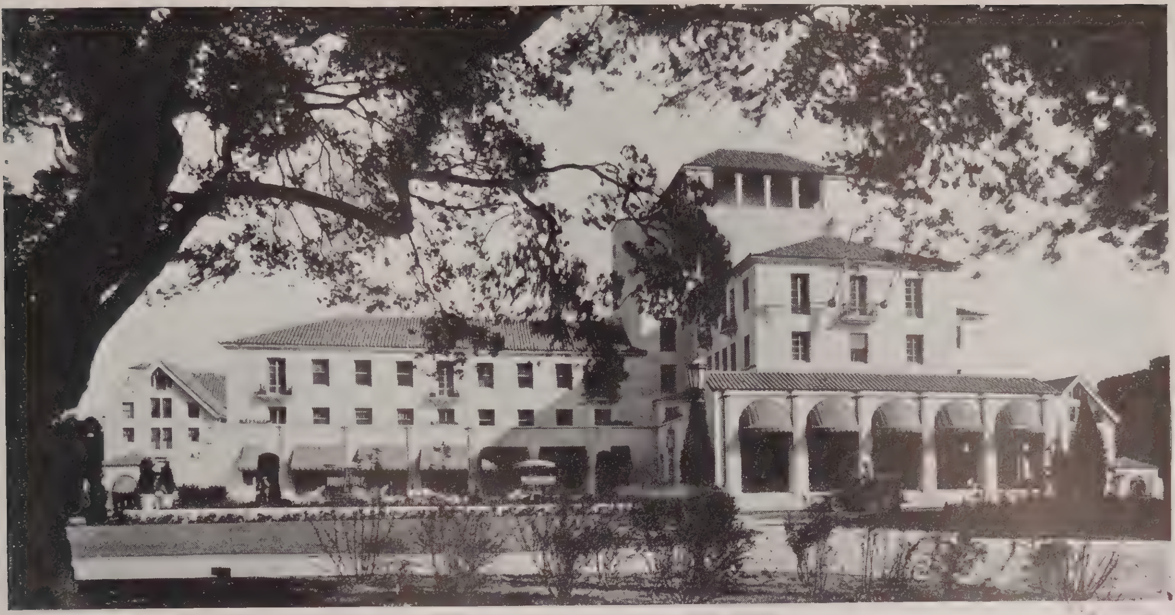
FOR a suburban hotel containing only 110 guest rooms, the plan of the Del Monte is convenient and interesting. It is of a rambling design with many wings. Above the unusually high first story there are only two floors of bedrooms; with each room a bath is connected. The hotel is entered from a long arcaded loggia extending across the front of one of the wings. From this entrance loggia the main lobby of the hotel is reached through an entrance hall, on either side of which are located coat rooms and lavatories. From this lobby on one side there extends a wing, on the first floor of which are located three shops and a long sun porch which opens upon a terraced garden. At the opposite end of this center of the lobby, just a short distance from the hotel, there is a large swimming pool which is one of the many attractive features of this suburban hotel. Beyond the lobby in the opposite direction from the main entrance is a large lounge, which opens onto attractive terraces on both sides. Beyond the lounge a few steps lead



First Floor Plan

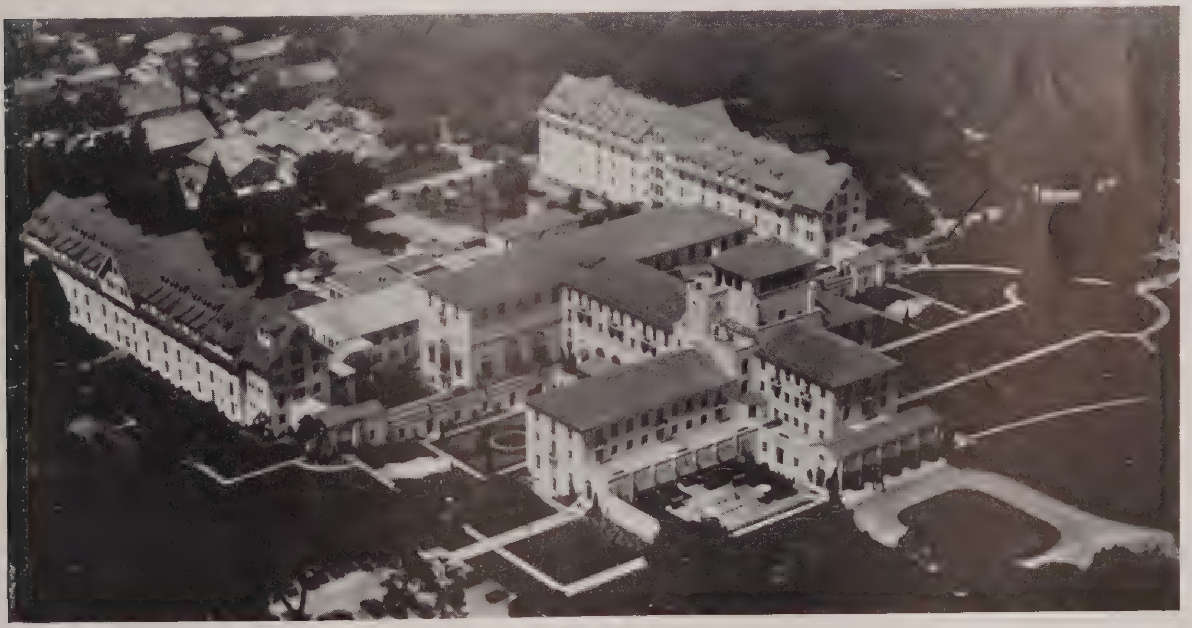
Third Floor Plan

Del Monte Hotel, Del Monte, Cal.
Lewis P. Hobart and Clarence A. Tantau, Architects

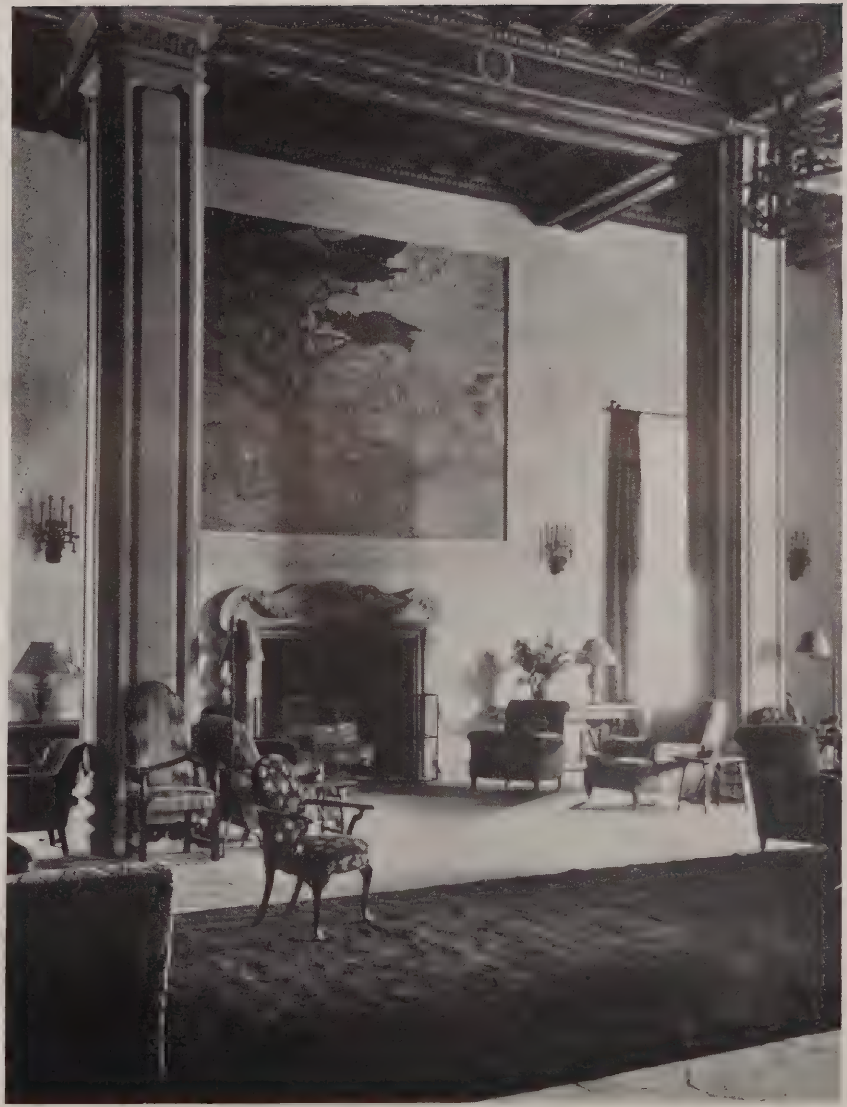


View of Entrance Facade

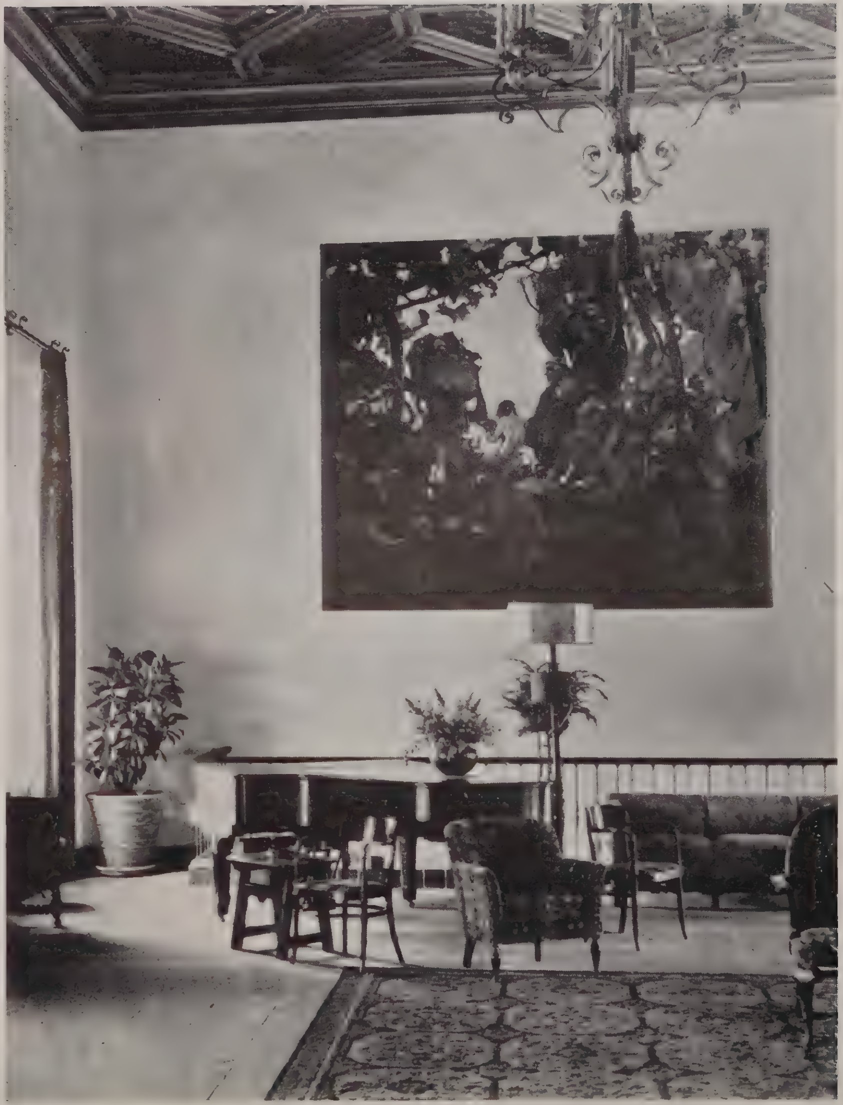
up through a wide archway into the lobby of the great dining room. This room is impressive in its length and proportions, as it runs the entire length of the rear wing of the hotel. As the plan of this particular building is in the shape of the letter H, this great dining room has windows on three sides. The unusual ceiling height of the main floor gives dignity to the dining room. It accommodates 800, the grill room 400, and the auditorium 300. The building is of reinforced concrete construction. Reinforced concrete and artificial stone trim are used on the exterior, and terra cotta tile and plaster partitions with hardwood trim on the interior. The floors are of reinforced concrete, except in the public rooms, where tile floors are used. The windows are of wood. Heating is by steam of the two-pipe system, and ventilation is by forced draft. The total cost of the hotel and eight cottages was $1,825,000. The building was completed in May, 1926.



Del Monte Hotel, Del Monte, Cal.
Lewis P. Hobart and Clarence A. Tantau, Architects

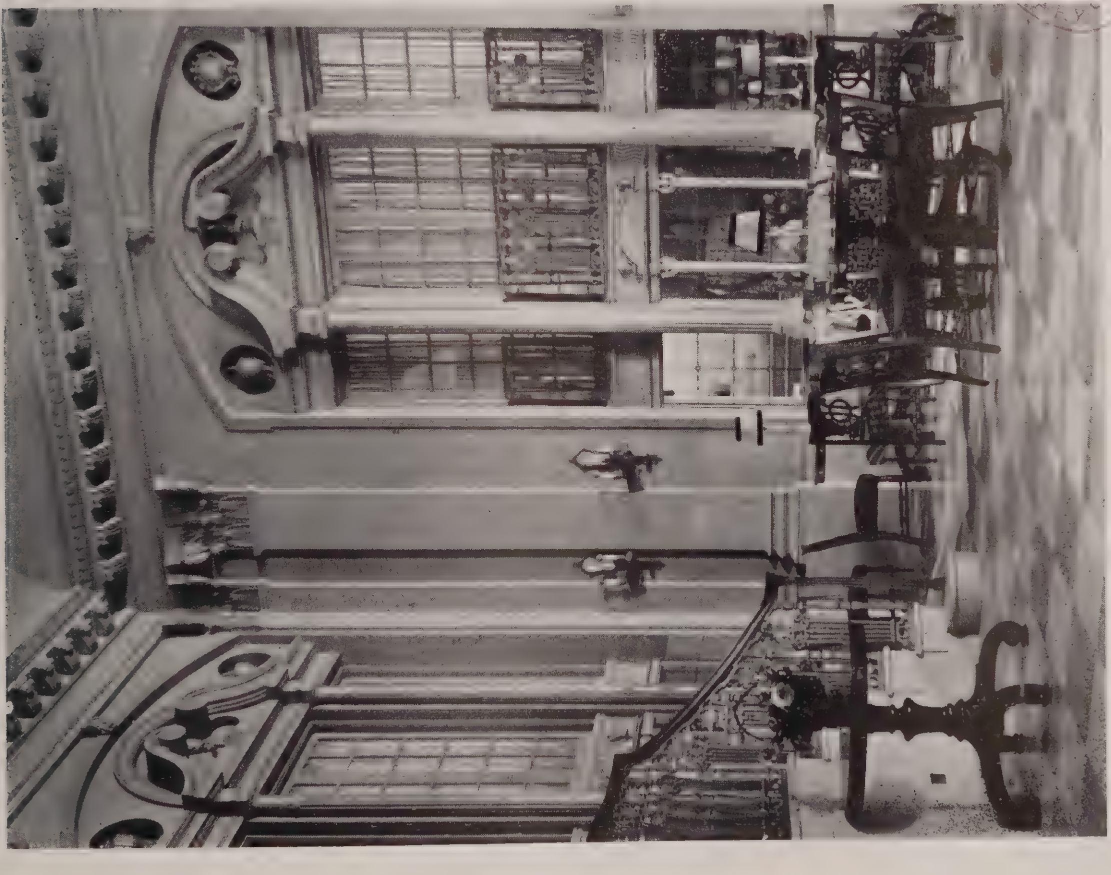


FIREPLACE IN THE LOBBY

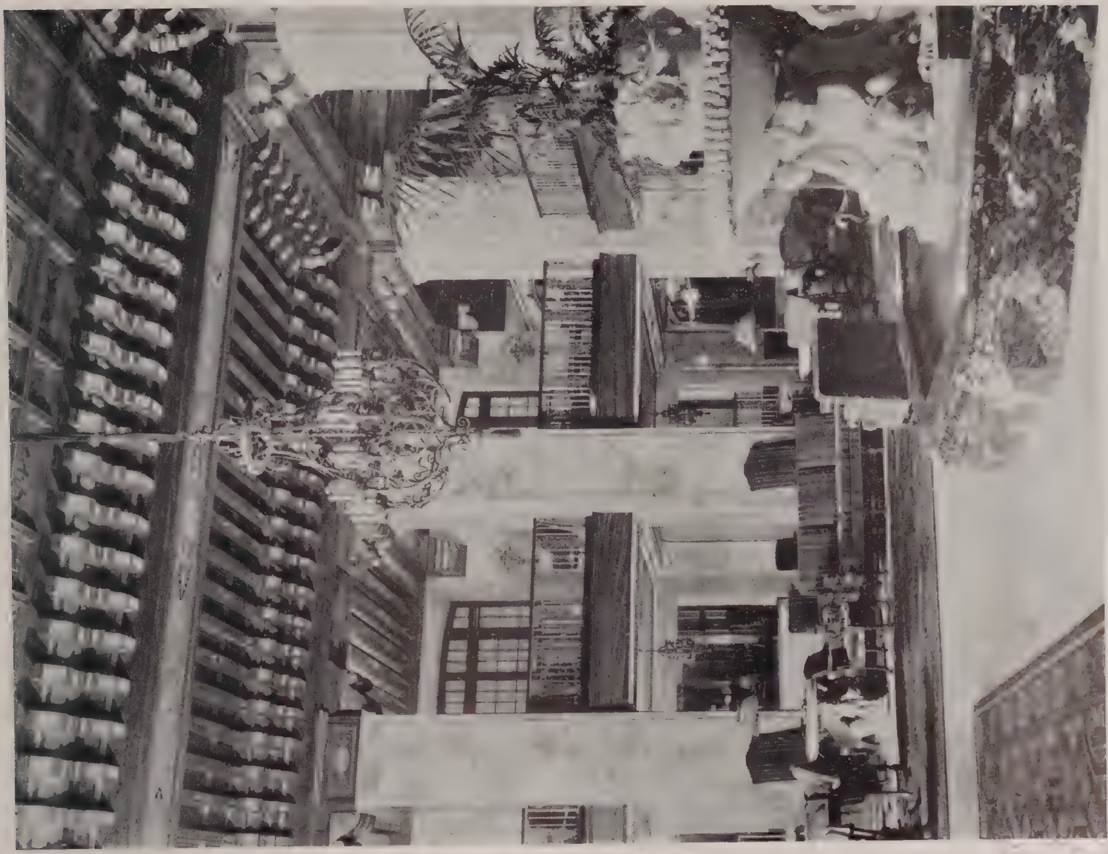


ONE CORNER OF LOUNGE

DEL MONTE HOTEL, DEL MONTE, CAL.
LEWIS P. HOBART AND CLARENCE A. TANTAU, ARCHITECTS

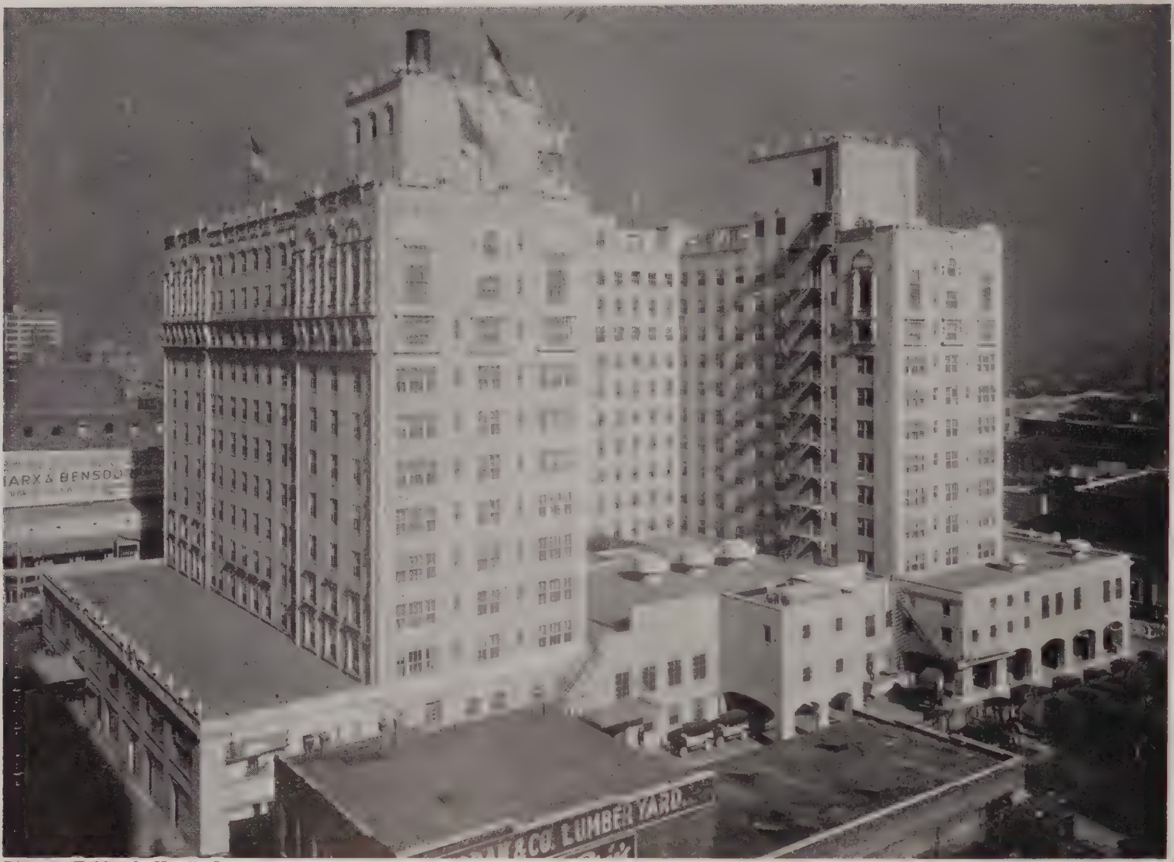


TEA ROOM



LOBBY

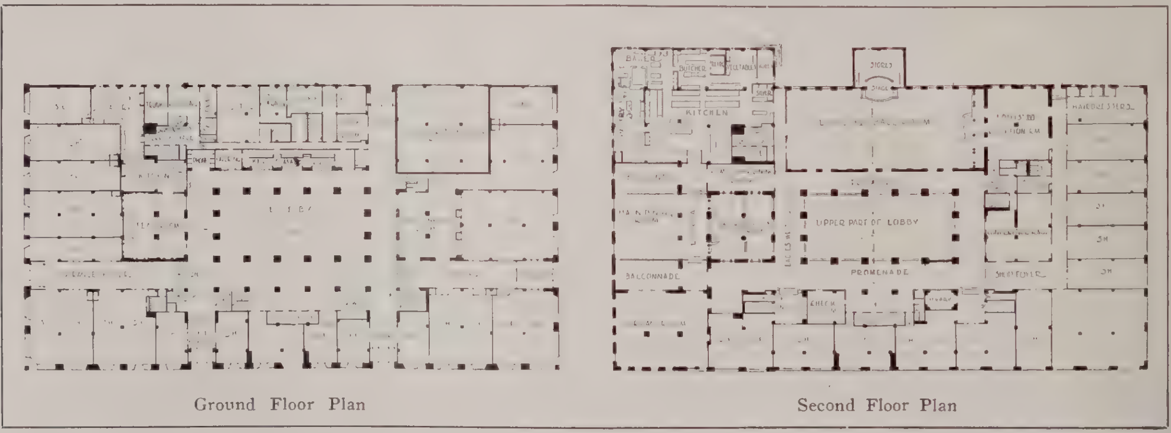
HOTEL PEABODY, MEMPHIS
W. W. AHLSCHLAGER, ARCHITECT



Photos. Tebbs & Knell, Inc.

General View

It is interesting to find in Memphis a hotel designed by one of the leading Chicago architects, W. W. Ahlschlager, the designer of several of the largest hotels and theaters in this country. Occupying an entire city block, the first two stories completely fill the land area, while the nine stories of bedrooms are U-shaped in plan. The only photograph obtainable of the exterior of the building is unfortunately a view from a position which gives little idea of the architecture. The hotel has long span concrete joist construction. Terra cotta and pressed brick are used on the exterior, and marble, tile, wood, and plaster on the interior. The floors are of marble and cement. Vacuum steam high pressure heating is used. There is ventilation in all the public rooms. The cost per cubic foot was 48 cents without furnishings or equipment. Cost was $2,550,000 in 1925.

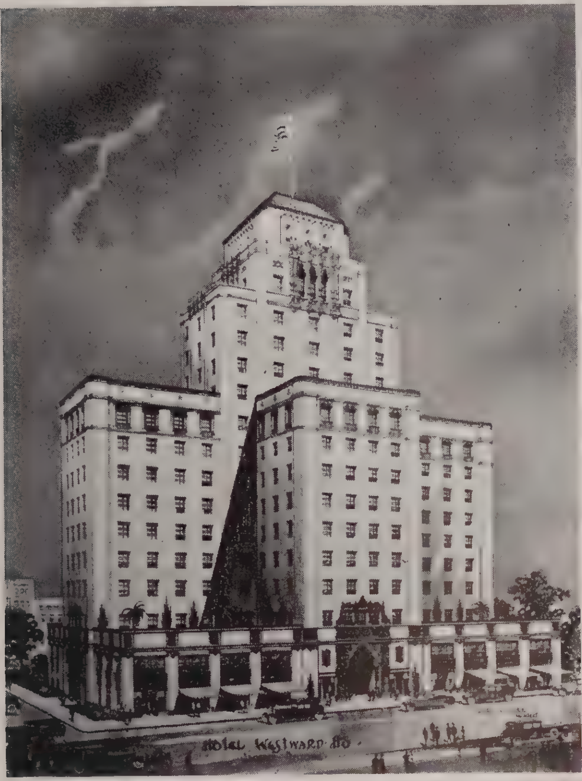


Ground Floor Plan

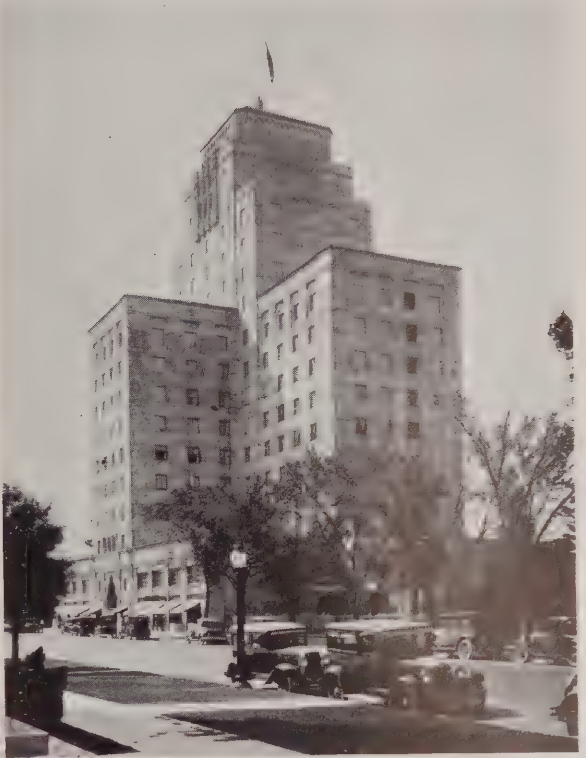
Second Floor Plan

Hotel Peabody, Memphis

W. W. Ahlschlager, Architect

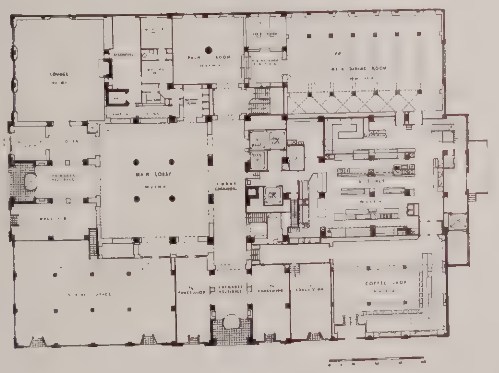


Preliminary Study

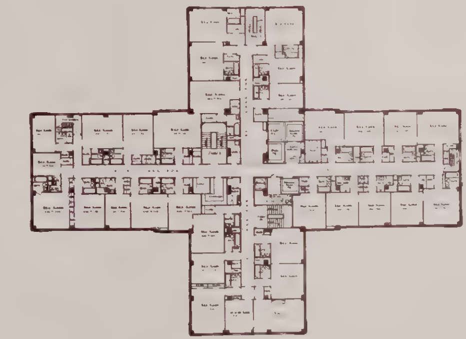


General View

THE Hotel Westward Ho is one of the most recent outstanding examples of hotel building in the southwest. It is interesting in both plan and design. The two first stories, the lower of which includes shops on the ground floor, are rectangular in plan, occupying the entire block area. The design is simple and straightforward in character, enriched by ornate Baroque Spanish ornament around the entrance door and the open loggia on the fifth floor of the tower. The interior architecture combines motifs from the Mexican, Spanish and Italian Renaissance styles, including an exterior decorative treatment suggesting the old chapels of northern Spain. Every effort was made to carry out in accurate detail a modern adaptation of the architecture of ancient days. The hotel contains 304 guest rooms and 278 baths. The dining room, which is Pompeian in character, has a seating capacity of 300. The banquet room or ball room has a seating capacity of 325 guests and follows the architecture of northern Spain. The building is of reinforced concrete construction, the exterior walls being covered with stucco of textured finish. The

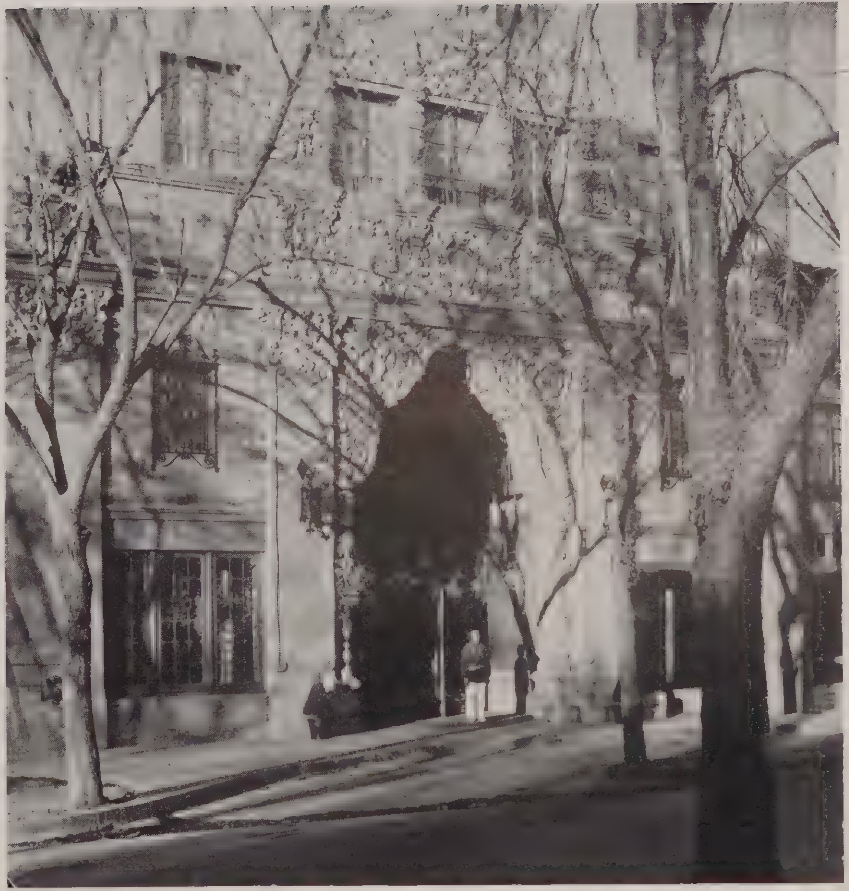


First Floor Plan

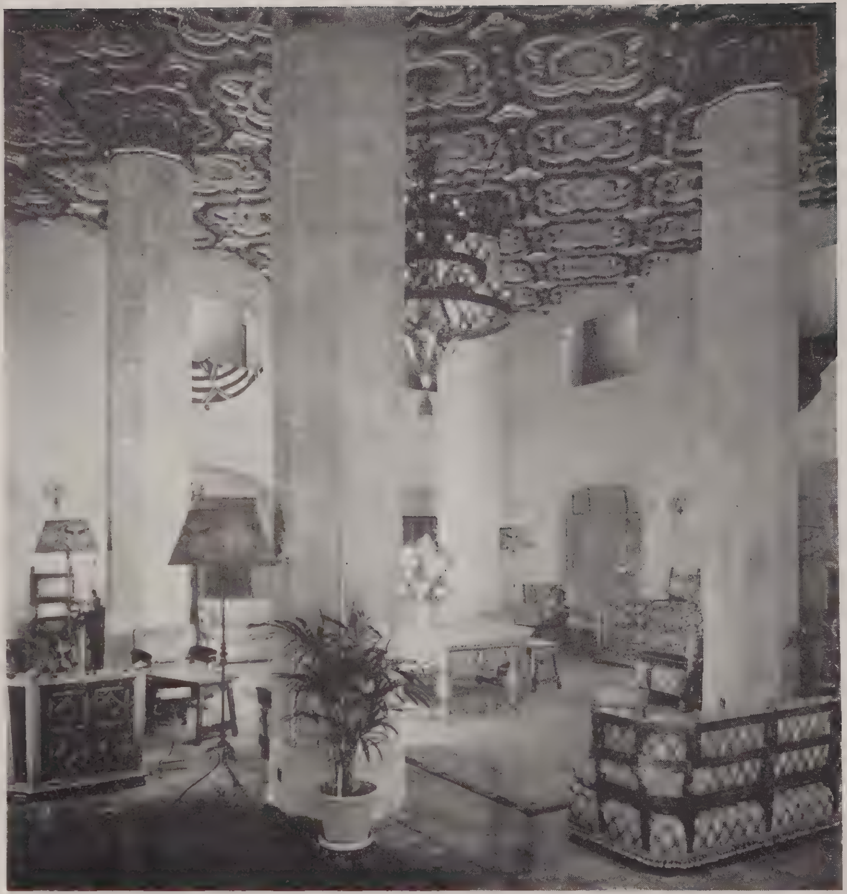


A Typical Floor Plan

Hotel Westward Ho, Phœnix, Ariz.
Louis L. Dorr, Architect



Main Entrance



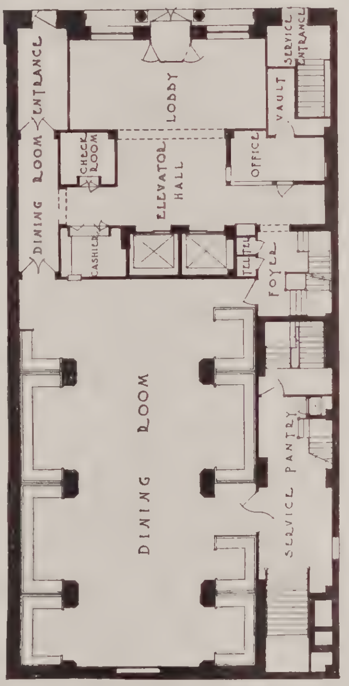
Lobby

main hotel lobby, from tiled floors to richly ornamented ceilings, is true to type to the last detail of the styles borrowed from Spain by the Mexicans. The walls of the main lobby are of travertine. The dining room, ballroom, lounge, palm room and foyers have walls of textured plaster with travertine trim, while the bedroom walls are of smooth plaster.

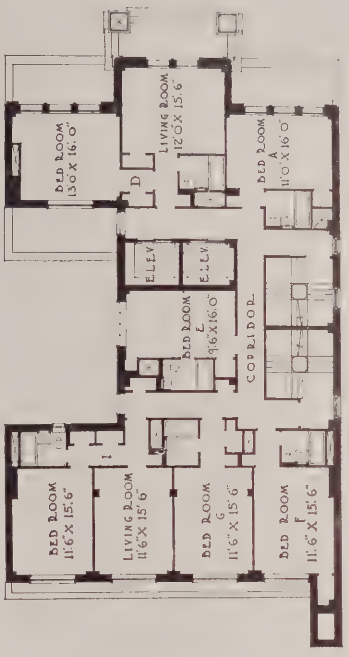
The heating plant of the hotel consists of high pressure boilers, including boilers which supply the steam to the kitchens and laundry. The heating system is of the two-pipe vacuum return design. The total cubic contents is 2,492,369 cubic feet, making a cost of 56 cents per cubic foot, or $4,500 per room, and a total cost of $1,572,000 in 1928.

Hotel Westward Ho, Phœnix, Ariz.
Louis L. Dorr, Architect

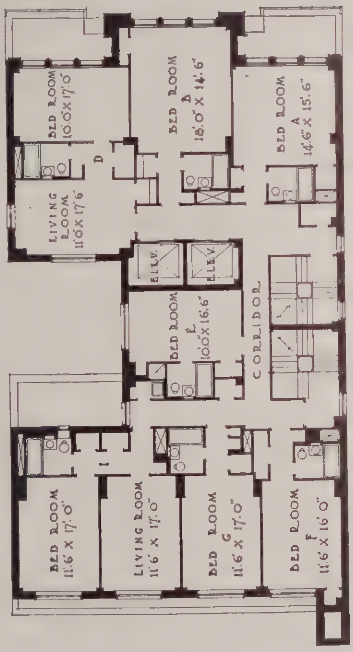
PLANS. HOTEL DUANE, NEW YORK
ANDREW J. THOMAS, ARCHITECT



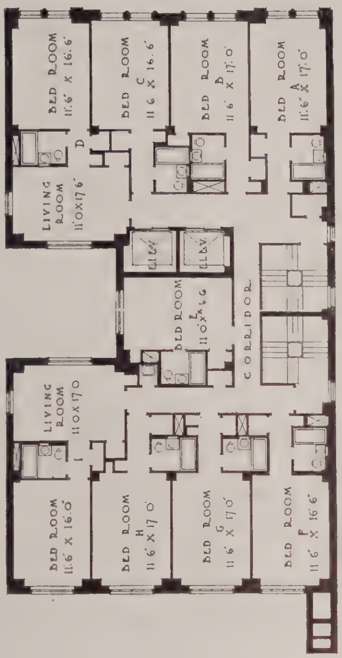
1ST FLOOR



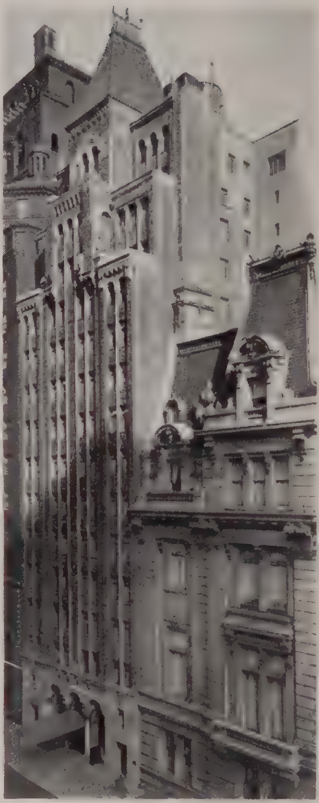
14TH AND 15TH FLOORS



12TH AND 13TH FLOORS

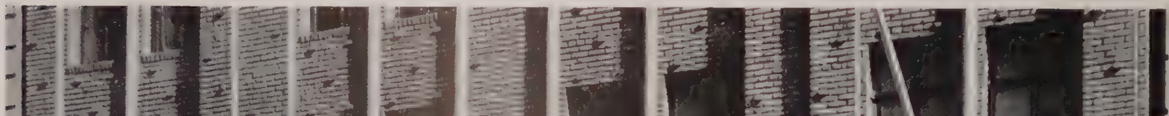


A TYPICAL FLOOR



THE Hotel Duane in New York is a small and exclusive residential hotel located in the heart of the still select Murray Hill district. Sandwiched in as it is between the Fraternity Clubs building on the north and the Democratic Club on the south, it occupies the site of two residences. In this limited space, approximately 50 feet wide by 100 feet deep, Andrew J. Thomas, the architect, has worked out a very compact, practical plan. One enters directly from the sidewalk level into a shallow lobby, beyond which is the elevator hall. As this hotel has only 149 guest rooms and is strictly a residential hotel rather than of the transient type, no large lounge or entertaining rooms are needed. For this reason half of the lower floor is devoted to a large dining room and service pantry.

In design the exterior of the building indicates a free interpretation of the Italian Romanesque style harmonizing very well with the Fraternity Clubs building at the north, designed in a similar style. The entrance lobby and dining room are unusually attractive in a rather free interpretation of Spanish Renaissance decoration. The floors are deep toned tile and terrazzo contrasting pleasantly with rough plaster walls and beam ceilings. The furniture, draperies and lighting fixtures are all carried out in the Spanish style. The Duane was completed in 1927. Steel frame construction, concrete floor slabs, brick, hollow tile and stone were used in its construction. Granite, cast stone and face brick were the materials of the front elevation. Plaster, marble, and tile were used on the interior. Casement windows having steel frames and sash were used throughout. The heating is by the vacuum system, the steam being supplied from the outside. A complete ventilating system with blowers, exhausters, air filters, tempering stacks and direct heating was installed.



Photos, George H. Van Anda

Hotel Duane, New York

Andrew J. Thomas, Architect

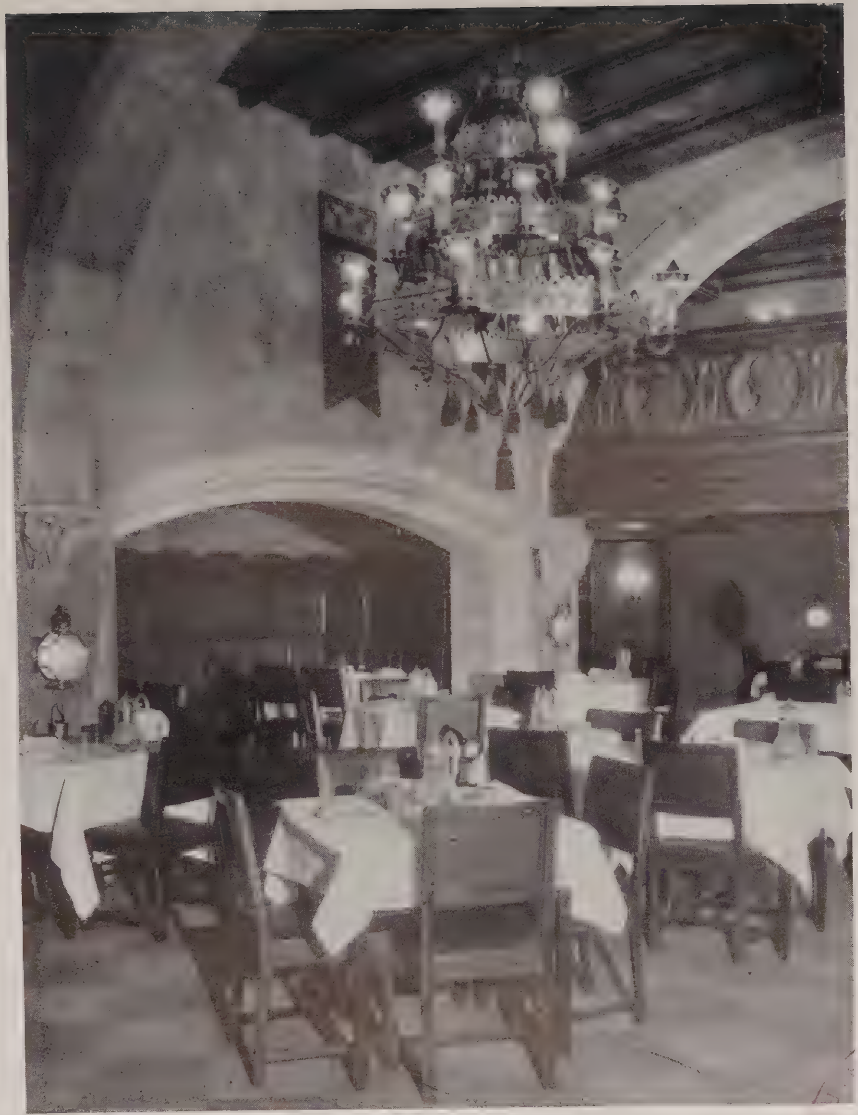
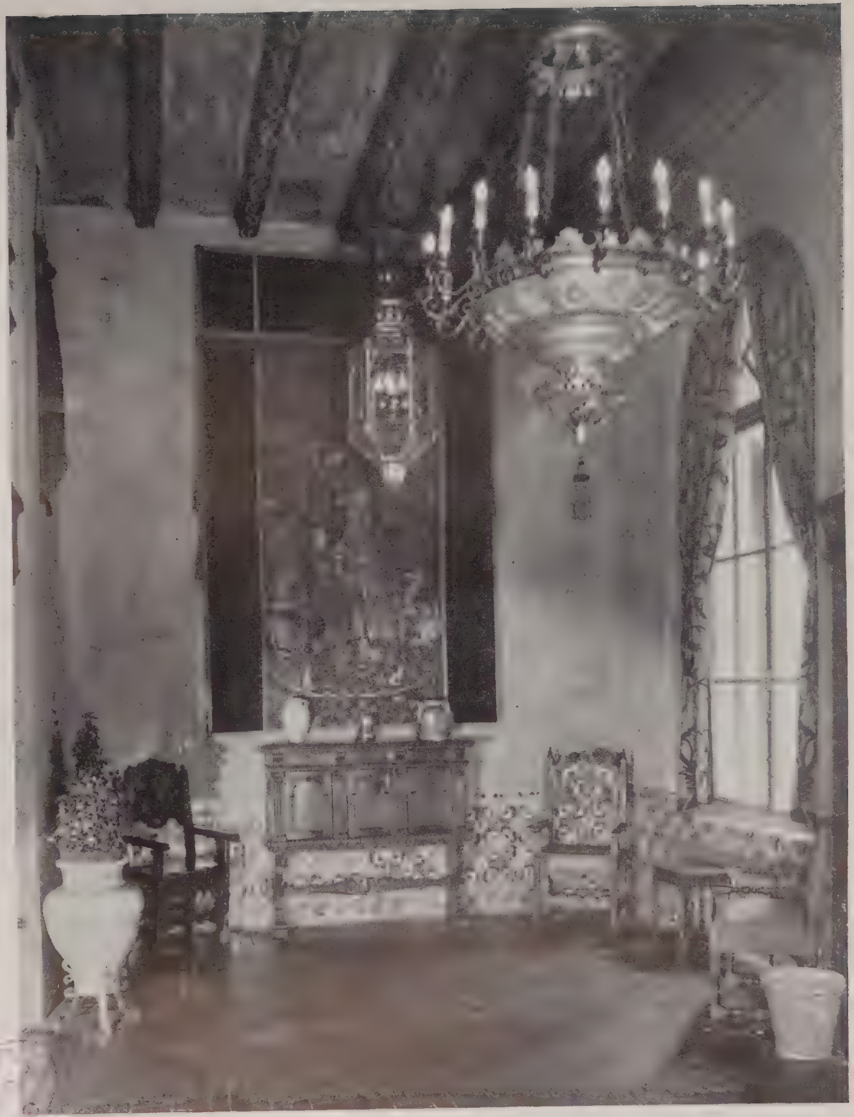
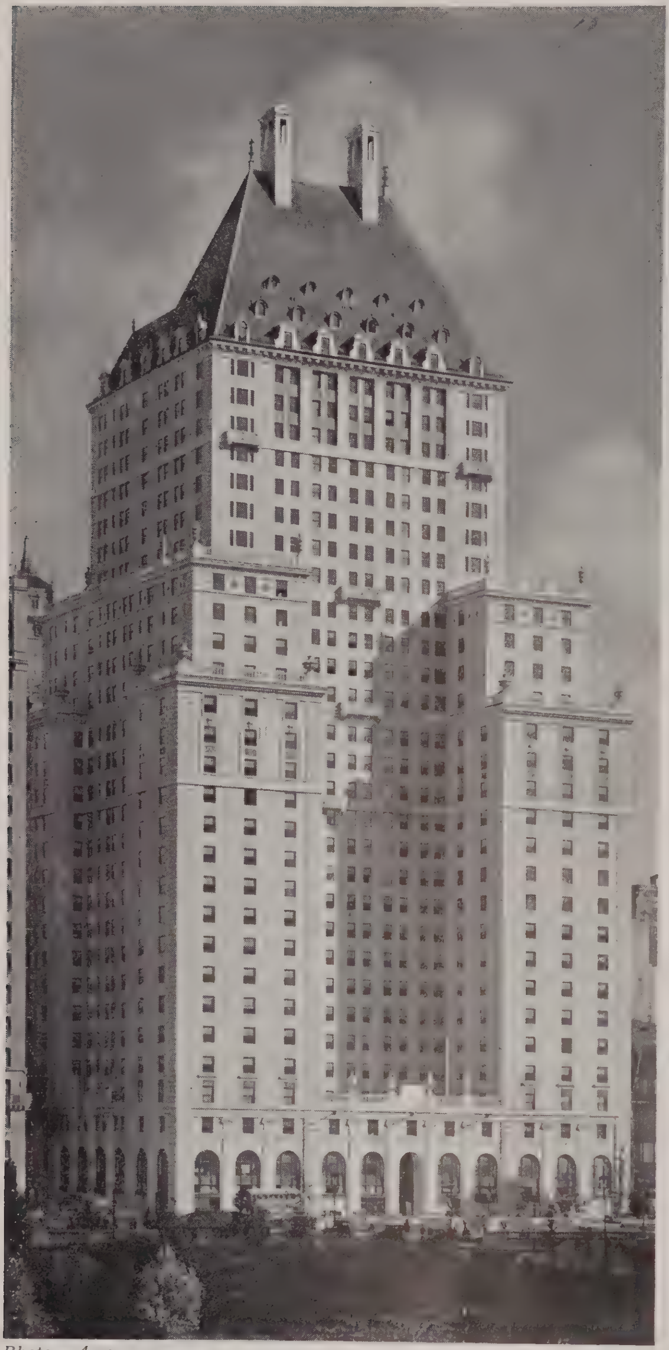


Photo. George H. Van Anda

DINING ROOM
HOTEL DUANE, NEW YORK
ANDREW J. THOMAS, ARCHITECT



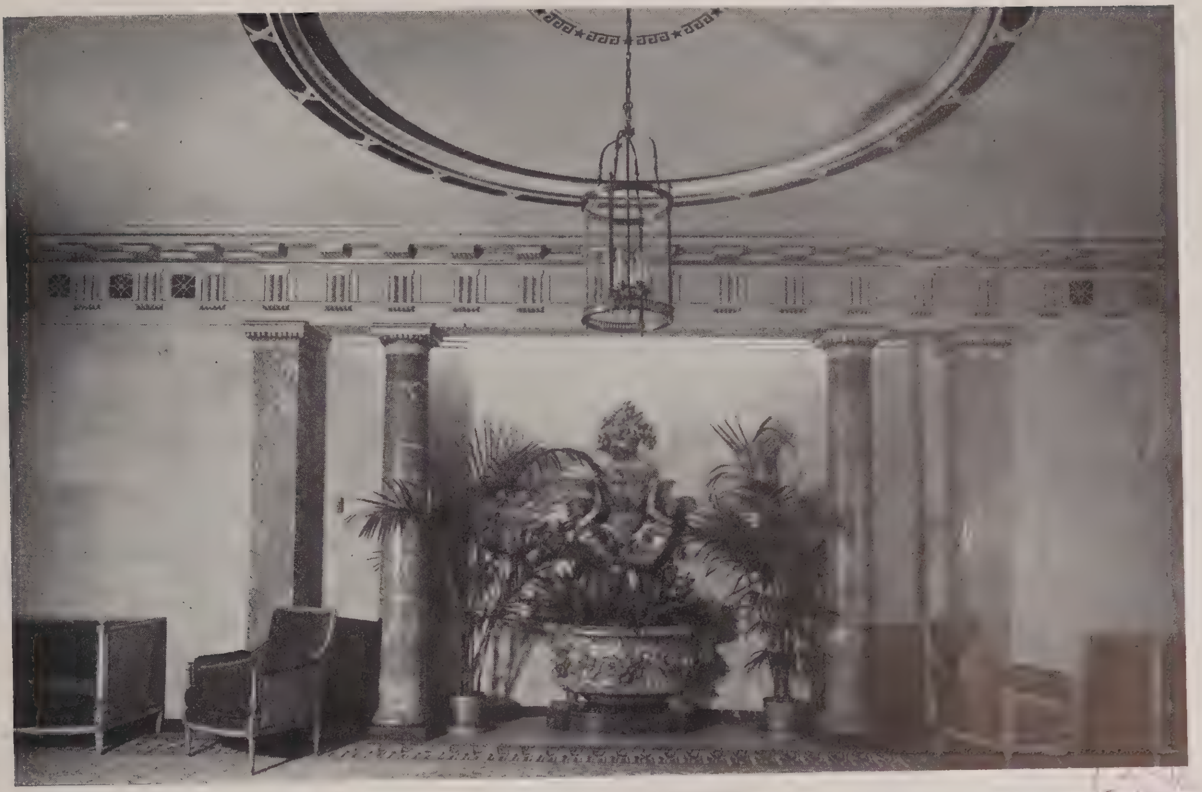
LOBBY
HOTEL SCHROEDER, MILWAUKEE
HOLABIRD & ROOT, ARCHITECTS



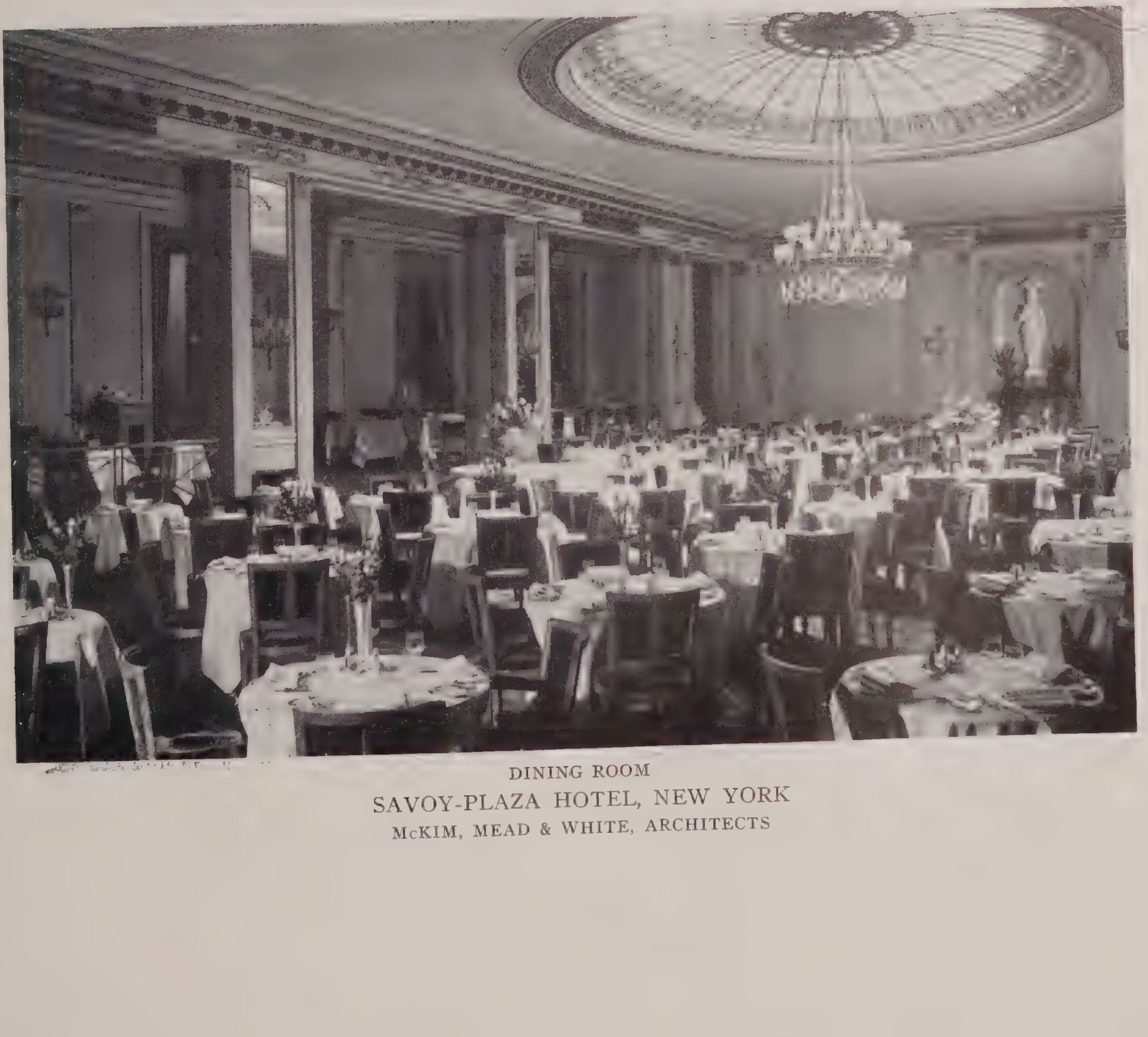
Photos. Amemya

Savoy-Plaza Hotel, New York
McKim, Mead & White, Architects

AT Fifth Avenue, 58th and 59th Streets in New York, for a great many years stood the Savoy Hotel. In its day it had been a well known hostelry, but with the erection of the new Plaza Hotel across the square the Savoy gradually lost its position as one of the foremost New York hotels. In 1926 it was demolished, and on its site McKim, Mead & White erected the Savoy-Plaza Hotel, which now dominates the square. In exterior design this great hotel is one of the finest in the country. In the relation of its masses and set backs, the design is particularly satisfying. Facing Fifth Avenue, wide bays 16 stories in height rise at each of the four corners. Low set backs four stories in height crown these bays, appearing in design as buttresses to the huge central mass of the hotel, which rises to a height of 30 stories surmounted by a very high hip roof suggesting the French chateau style. From the arcaded entrance floor with its Ionic pilaster treatment to the dormers on the roof line, a modern interpretation of Italian classic detail has been consistently carried out. In plan the three lower stories occupy the entire rectangular plot. Starting with the fourth floor, the plan takes the shape of the letter H, which arrangement permits every bedroom in the hotel to have outside light and air. In plan and general mass the Royal York Hotel in Toronto is quite similar to the Savoy-Plaza, although occupying a greater land area. Consistent with the plan of all modern city hotels, the three street sides of the entrance floor are given over to shops. This arrangement need in no way detract from the dignity or character of a hotel, but on the other hand provides a most practical and direct method of assisting in the permanent financing of the hotel. The plan of this hotel is unusually convenient, and logical. On the first or ground floor there are entrances on all three sides. To avoid the congestion of traffic on Fifth Avenue, the principal entrance is on 58th Street, which happens to be an east-bound street, so that vehicular approach to the hotel is directly gained from Fifth Avenue. Entering the main foyer from 58th Street, a wide lobby and corridor lead through the hotel to 59th Street. Opening off this lobby are the eight elevators and the principal stairway leading to the second or main floor. Also off of this central corridor is the entrance to the dining room which occupies a large part of the rear of this floor. Adjacent to this dining room on the 58th Street front is a lounge or reception room. On the second floor are a large central lounge and several smaller rooms used for private dinners and receptions. On the Fifth Avenue and 59th Street sides of this floor shops are also located. The interior decorations throughout are rich and colorful adaptations of the Italian and French Renaissance styles. The reception room at the right of the entrance on the first floor is in the Louis XV style.



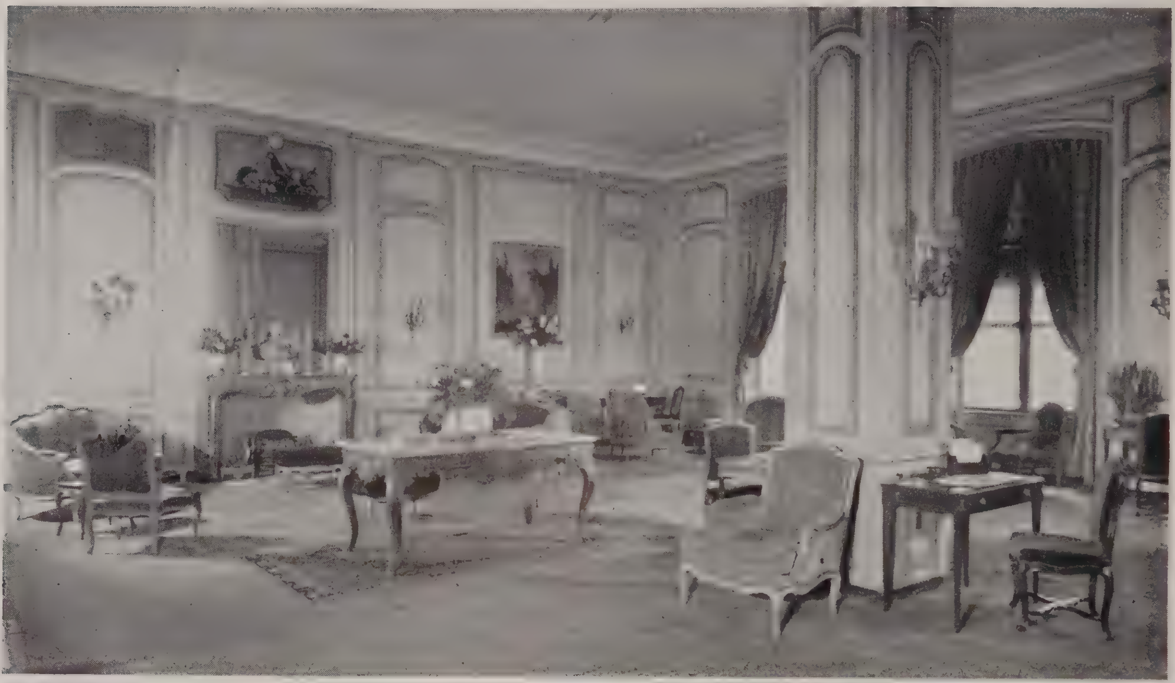
DETAIL OF MAIN LOUNGE



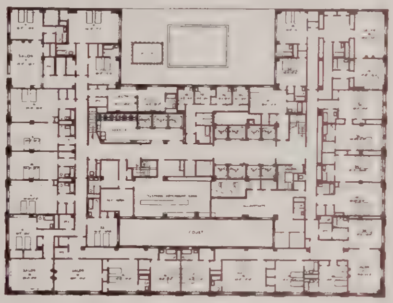
DINING ROOM

SAVOY-PLAZA HOTEL, NEW YORK

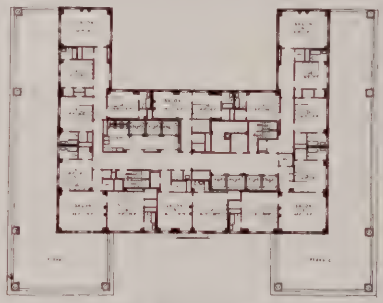
McKIM, MEAD & WHITE, ARCHITECTS



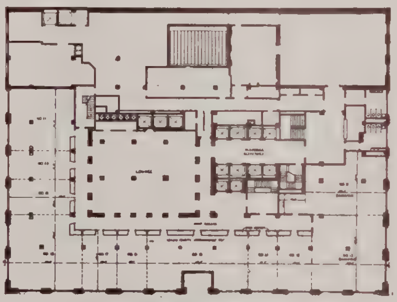
RECEPTION ROOM ON FIRST FLOOR



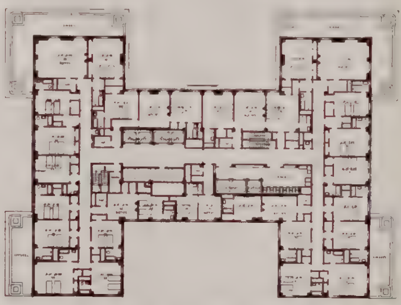
3RD FLOOR PLAN



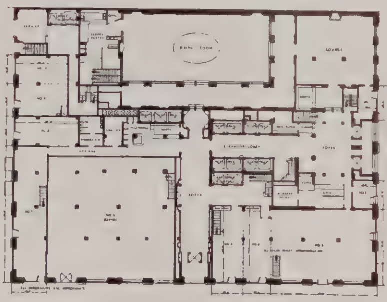
22ND FLOOR PLAN



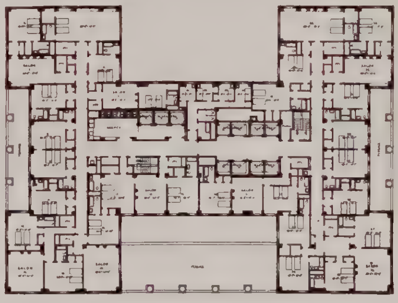
2ND FLOOR PLAN



18TH FLOOR PLAN



1ST FLOOR PLAN



4TH FLOOR PLAN

SAVOY-PLAZA HOTEL, NEW YORK
McKIM, MEAD & WHITE, ARCHITECTS

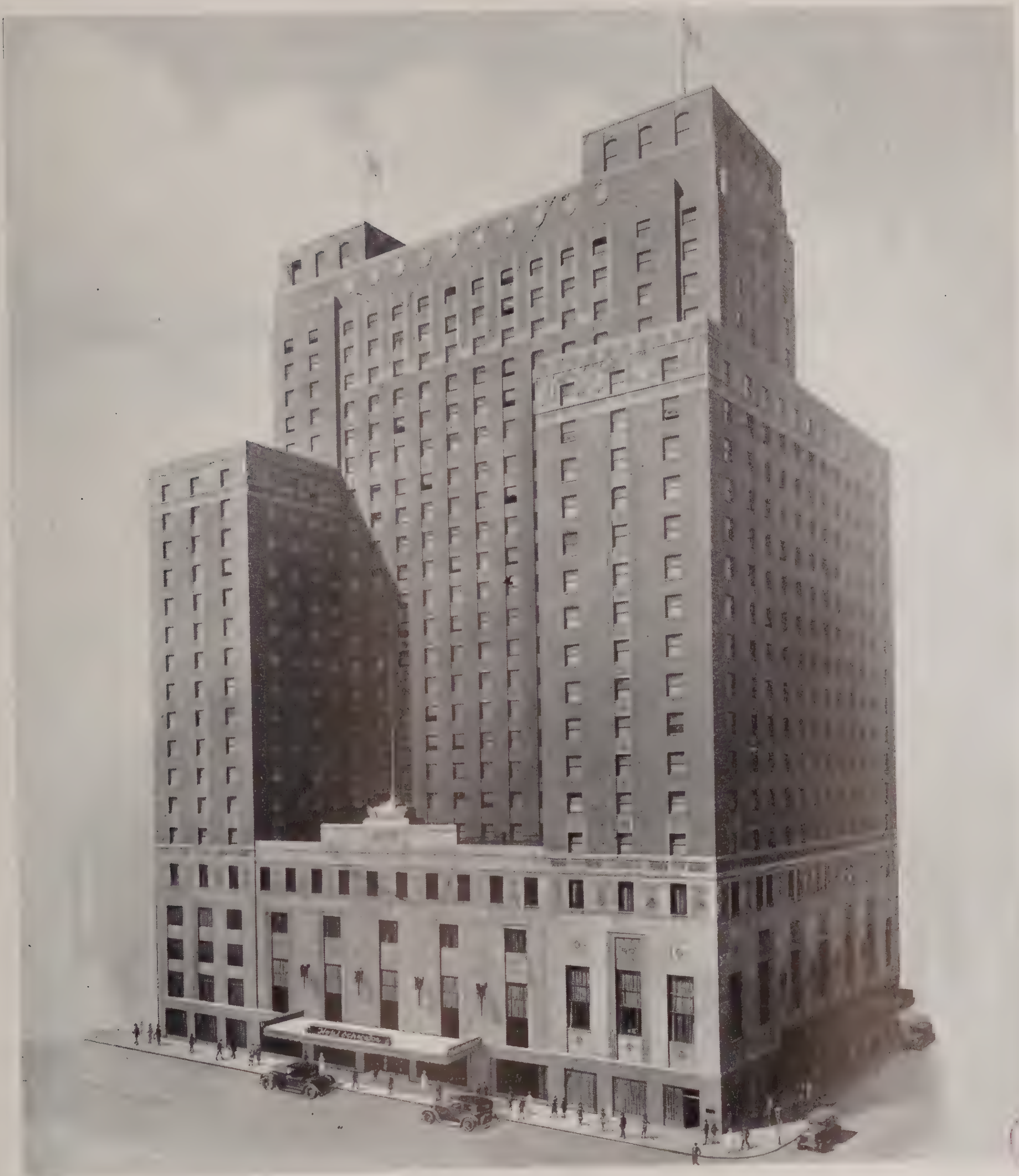
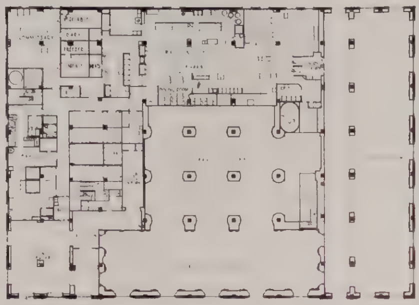


Photo. Fahsel & Weller

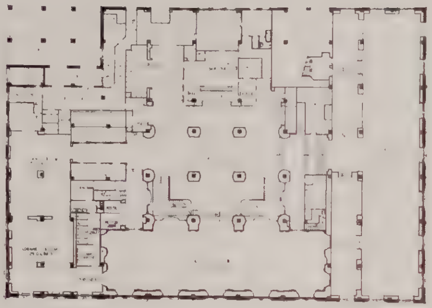
Hotel Schroeder, Milwaukee

Holabird & Root, Architects

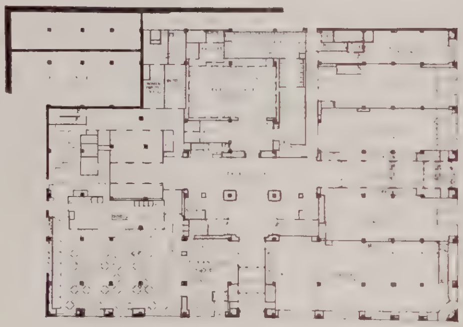
THIS straightforward and splendid piece of hotel designing is carried out in the modern manner. Dignity and simplicity and lack of architectural decoration characterize the exterior. Again the H-shaped plan has been used for 13 of the stories, an arrangement which permits all of the rooms to have outside light and air. Completed in 1927, this hotel is of fireproof construction with steel frame and concrete arch floors. For the exterior walls stone was used for the first four stories and brick for all above. Every one of the 820 bedrooms has its individual bath. The capacity of the combined dining rooms is 800, and that of the ballroom 1,200. The building contains, 5,957,000 cubic feet and was built at a cubic foot cost of approximately 67 cents, amounting to a total cost of approximately $4,000,000. In the article on page 702 by Mr. Henry J. B. Hoskins of the firm of Holabird & Root several illustrations of interiors are shown.



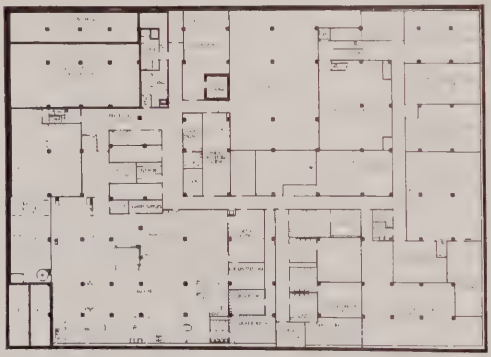
3RD FLOOR



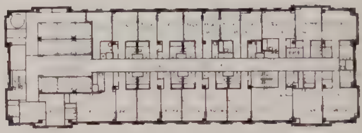
2ND FLOOR



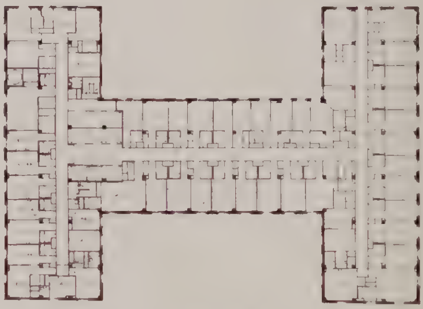
1ST FLOOR



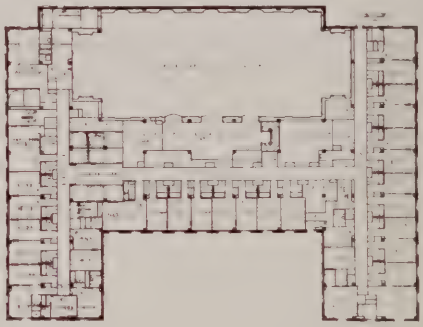
BASEMENT FLOOR



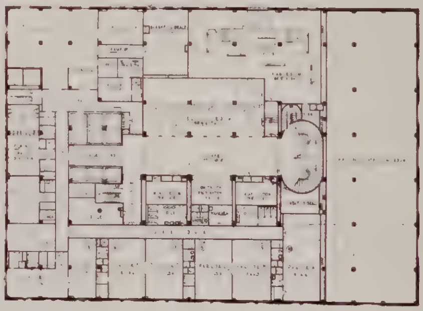
20TH TO 23RD FLOORS



7TH TO 19TH FLOORS

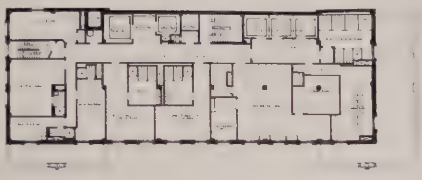


6TH FLOOR

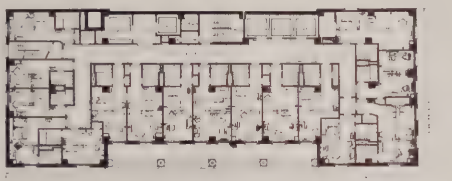


4TH FLOOR

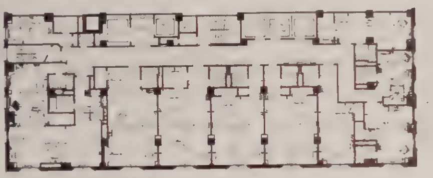
PLANS. HOTEL SCHROEDER, MILWAUKEE
HOLABIRD & ROOT, ARCHITECTS



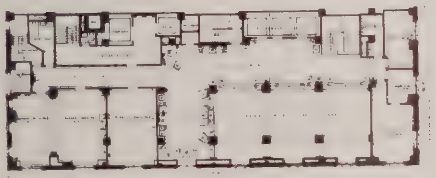
23rd Floor Plan



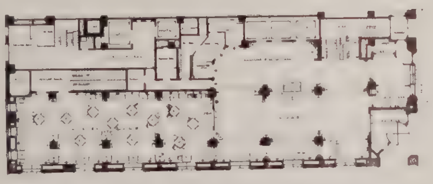
4th to 22nd Floor Plan



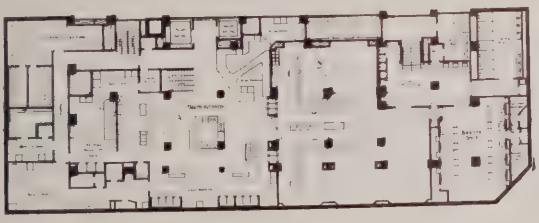
3rd Floor Plan



2nd Floor Plan



1st Floor Plan



Basement Plan

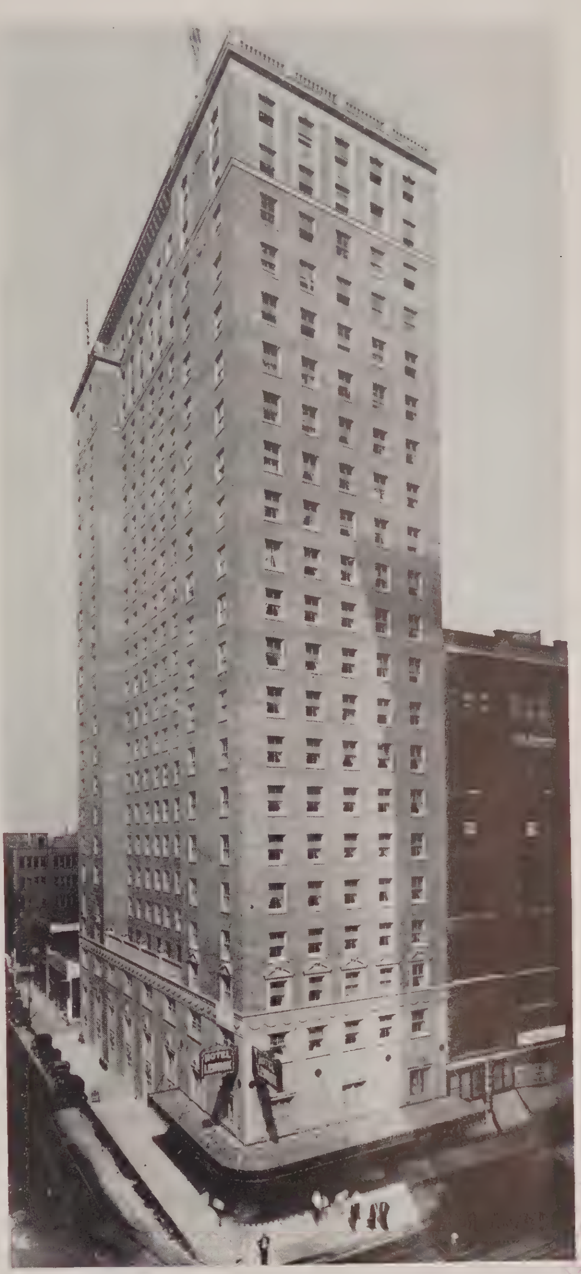


Photo. Eugene Taylor

Hotel Lennox, St. Louis
Preston J. Bradshaw, Architect

THE Hotel Lennox in St. Louis is an excellent example of a moderate sized, well planned city hotel. The lot on which it stands is a block in length but quite shallow in depth, which greatly influenced the plan and arrangement. It contains 315 guest rooms, each with a private bath. The seating capacity of the dining rooms is 220 people. The building is of reinforced concrete construction, and brick and terra cotta were used on the exterior. Windows are double-hung. The hotel contains 1,713,920 cubic feet and was built at a cost of 69 cents per cubic foot in 1929.

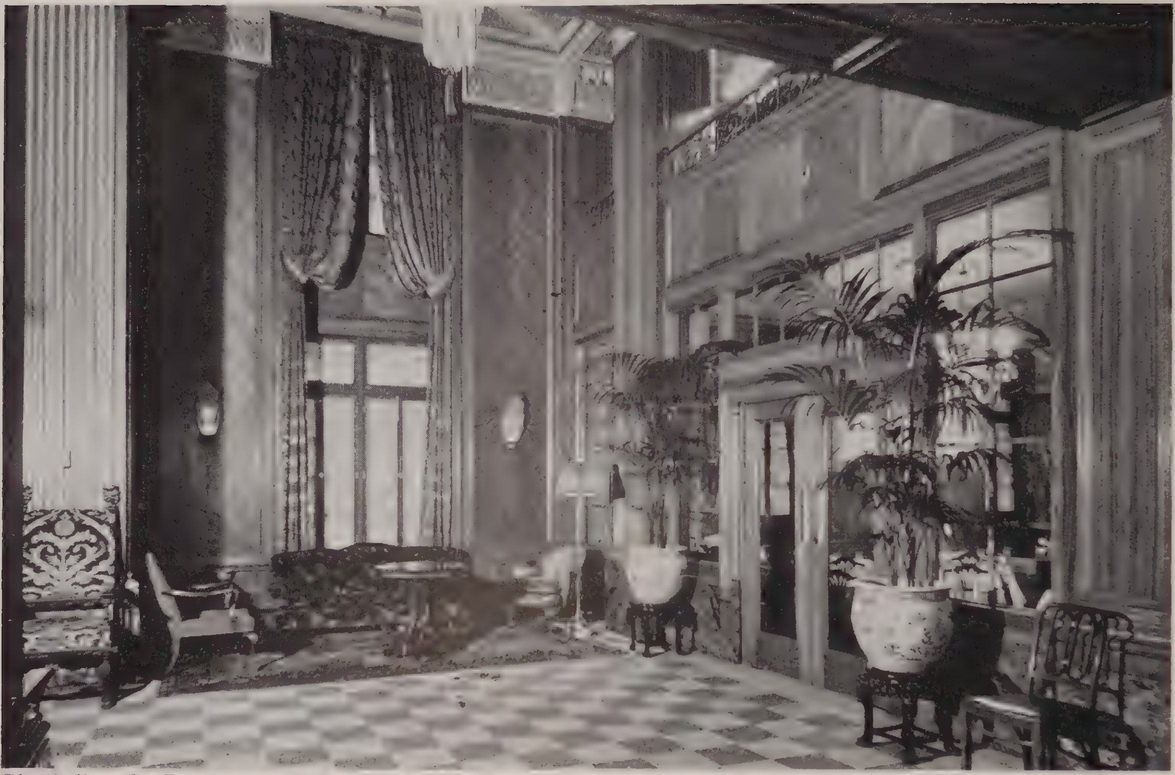
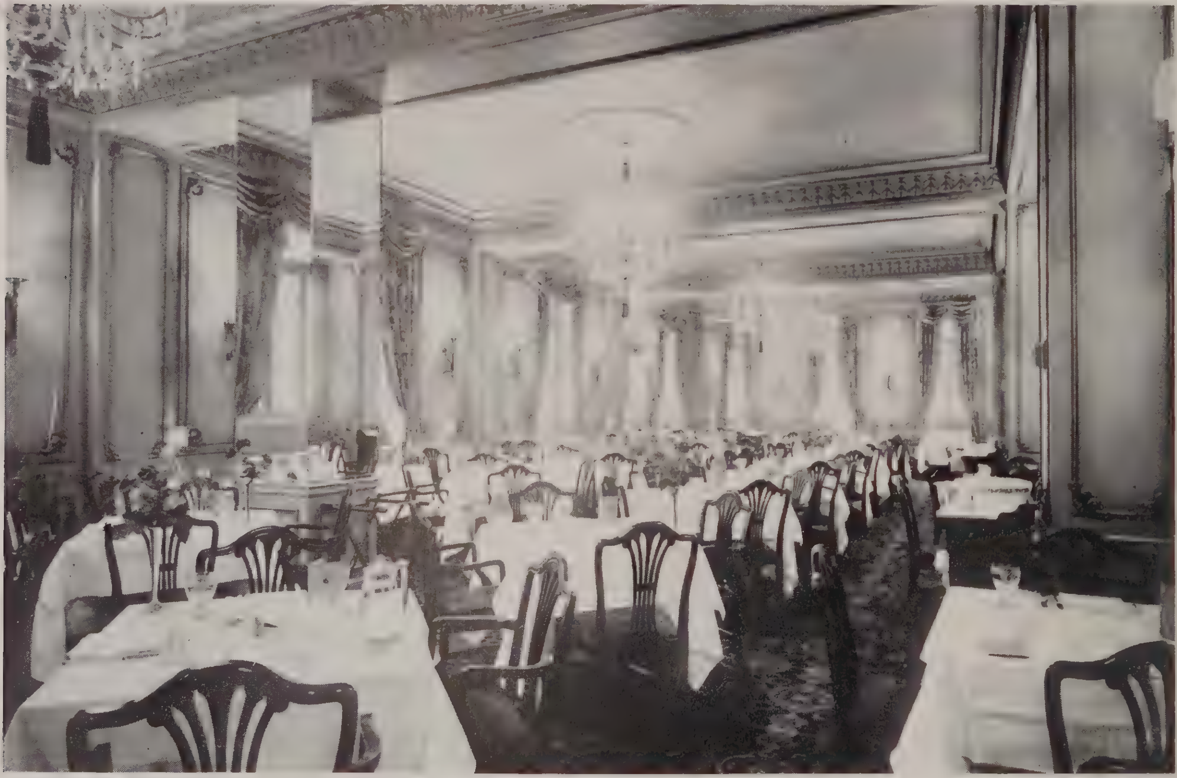


Photo. Alexander E. Piaget

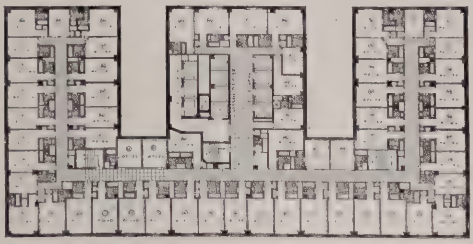
LOBBY



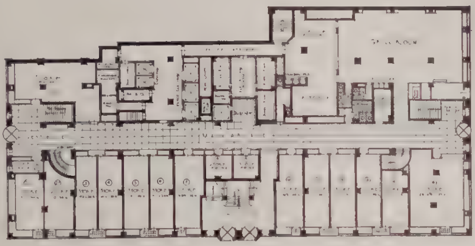
MAIN DINING ROOM

HOTEL LENNOX, ST. LOUIS

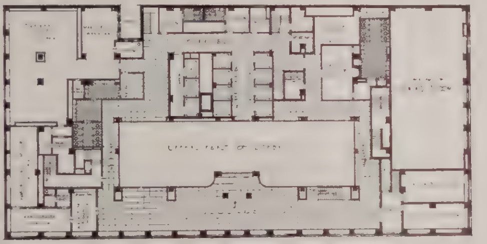
PRESTON J. BRADSHAW, ARCHITECT



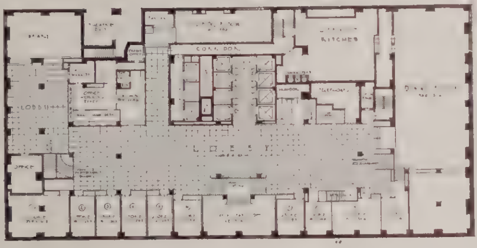
A Typical Floor Plan



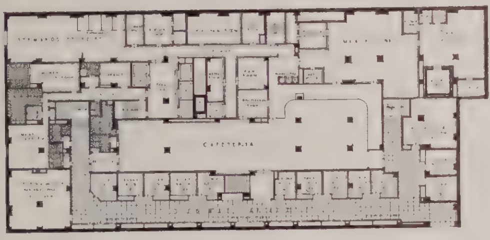
Second Floor Plan



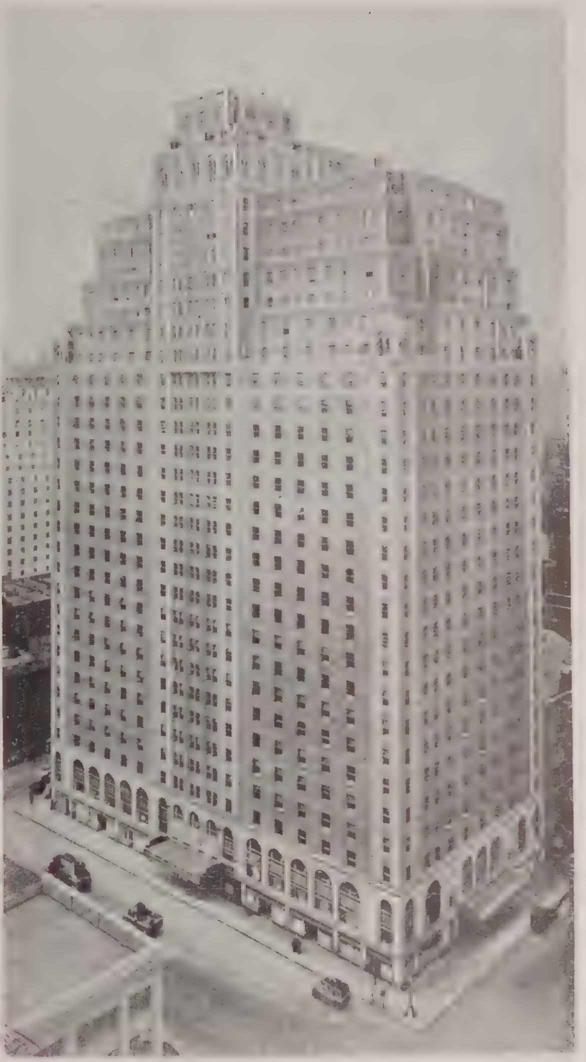
Mezzanine Floor Plan



First Floor Plan

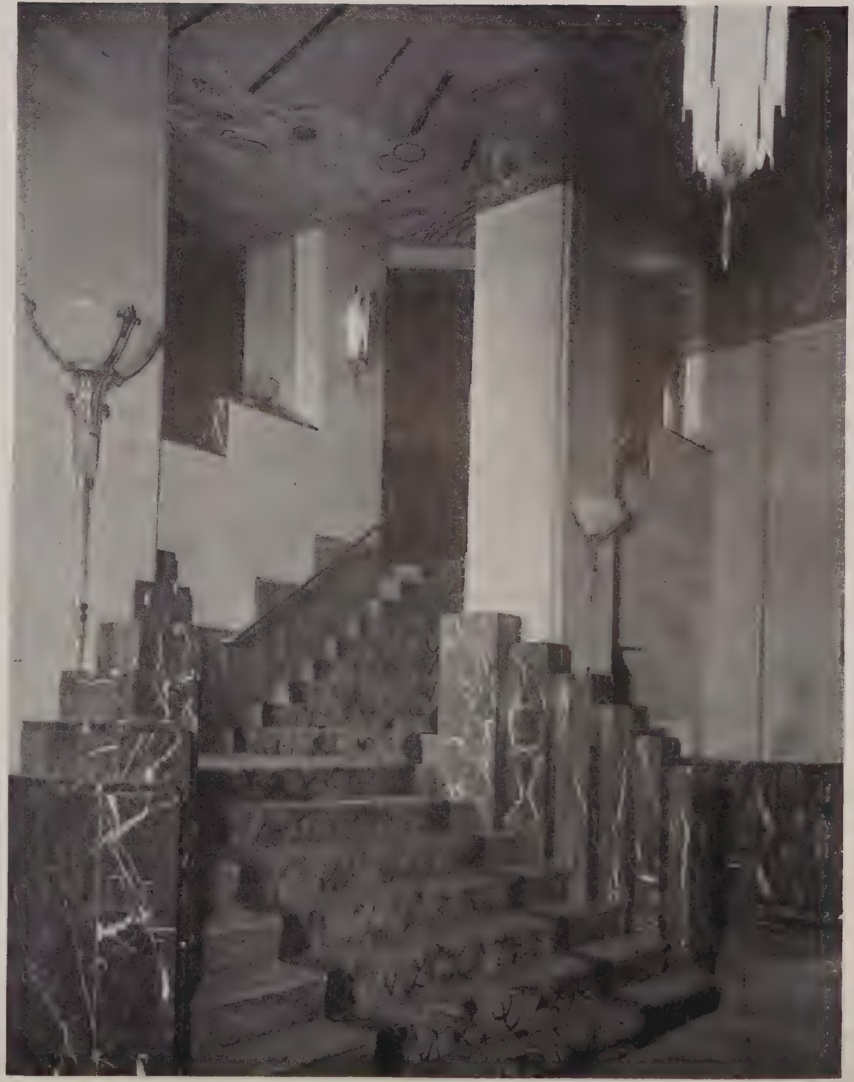


Basement Plan



Hotel Lincoln, New York
Schwartz & Gross, Architects

THE Hotel Lincoln is the tallest residential structure and the largest hotel in the Times Square district of New York. It contains 1,400 outside rooms, each with a private bath and shower. It is one of the few New York hotels provided with a hospital, which is thoroughly modern in its equipment, and serves guests, employes, and outside patients of the resident physician. Completed in 1928 at a time when great interest was being taken in the modern expression in interior decoration and furniture, it is not surprising to find in all of the public rooms of this hotel original and colorful examples of modern furniture and decoration. Carried out under the masterful direction of Jacques Delamarre, the architectural director of the Chanin Construction Co., which financed and built this hotel, a thoroughly consistent and logical scheme of decoration has been created throughout the house.



ENTRANCE STAIRS

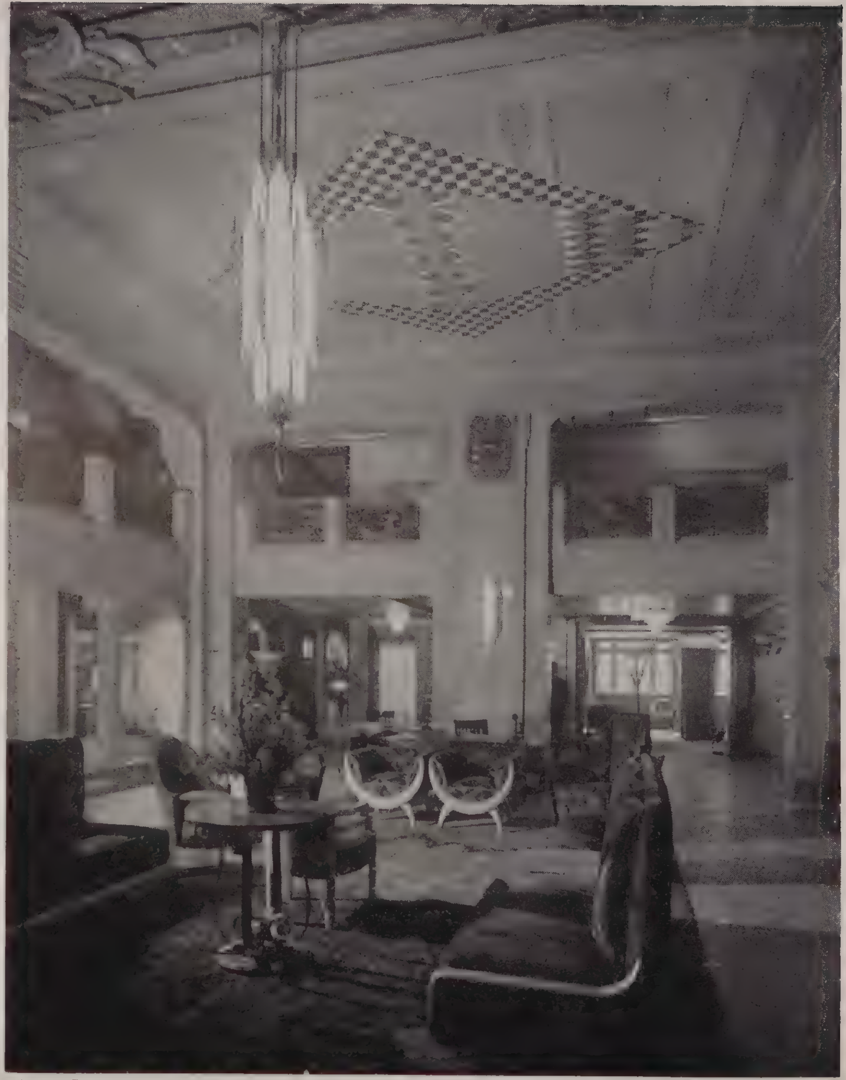
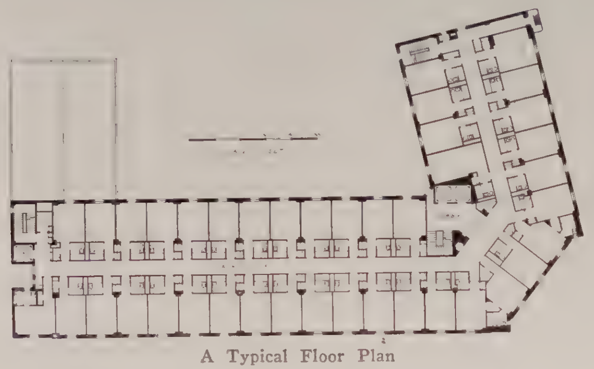


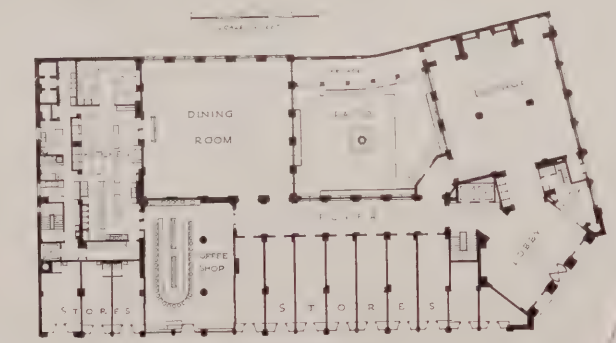
Photo. George H. Van Anda

MAIN LOBBY

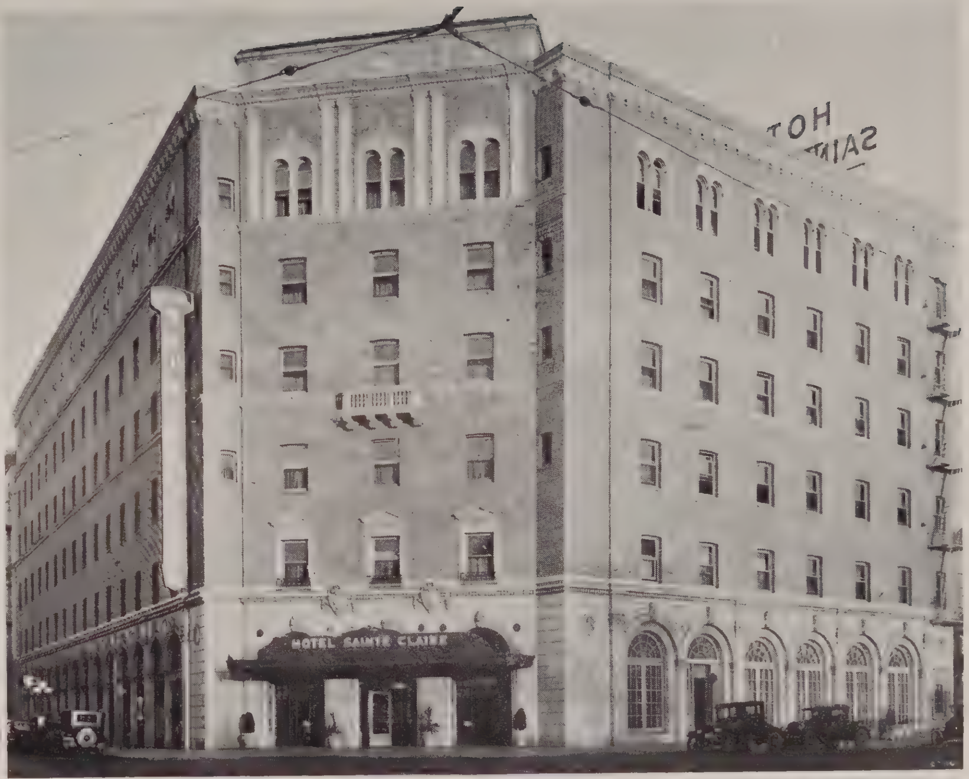
HOTEL LINCOLN, NEW YORK
SCHWARTZ & GROSS, ARCHITECTS
INTERIORS, J. L. DELAMARRE, ARCHITECTURAL DIRECTOR, CHANIN CONSTRUCTION CO.



A Typical Floor Plan



First Floor Plan



Photos. Gordon

Entrance Front

IN the Sainte Claire Hotel at San Jose, Cal., the architects, Weeks & Day, have designed in a logical and attractive way an excellent small city hotel. The peculiar shape of the site, which occupies a corner facing on two principal thoroughfares, greatly influenced the plan. Suggesting somewhat the plan of the Mark Hopkins Hotel in San Francisco, by this same firm of architects, the main entrance was placed at the corner, permitting an interesting recessed entrance bay at this point. Only six stories in height, with one street front occupied by small stores and a coffee shop on the ground floor, it was necessary to place the dining room and lounge at the rear of this floor. Between these two important public rooms it was possible to locate an interesting open court or patio with center fountain and side arcades. This hotel contains 184 guest rooms and 174 bathrooms. The dining rooms accommodate 444 people. The lighting is direct, and the heating is by steam of the two-pipe system. There is mechanical ventilation in the public rooms on the first floor, basement rooms and bathrooms. The building contains 1,440,000 cubic feet and was built at a cost of 52 cents per cubic foot. The total cost was $750,000. The hotel was completed in October, 1926.

Hotel Sainte Claire, San Jose, Cal.
Weeks & Day, Architects

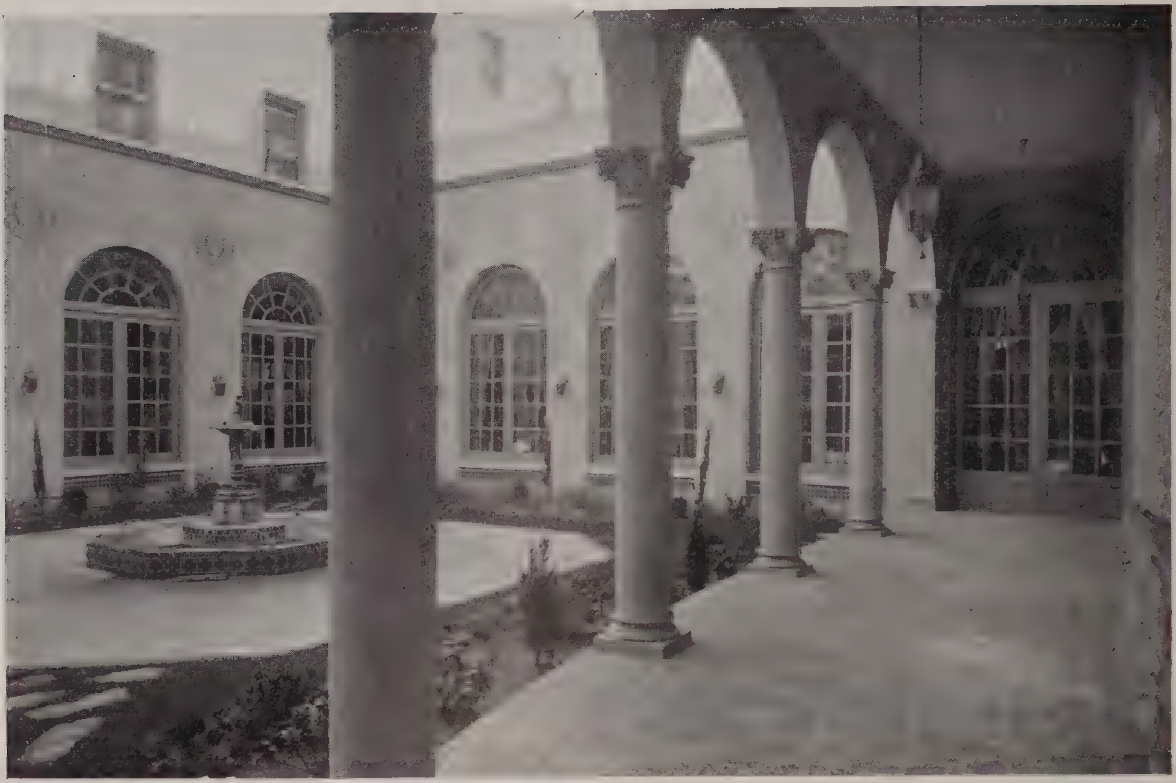


Photo. R. J. Waters & Co.

PATIO

OFFICE AND LOBBY

HOTEL SAINTE CLAIRE, SAN JOSE, CAL.

WEEKS & DAY, ARCHITECTS

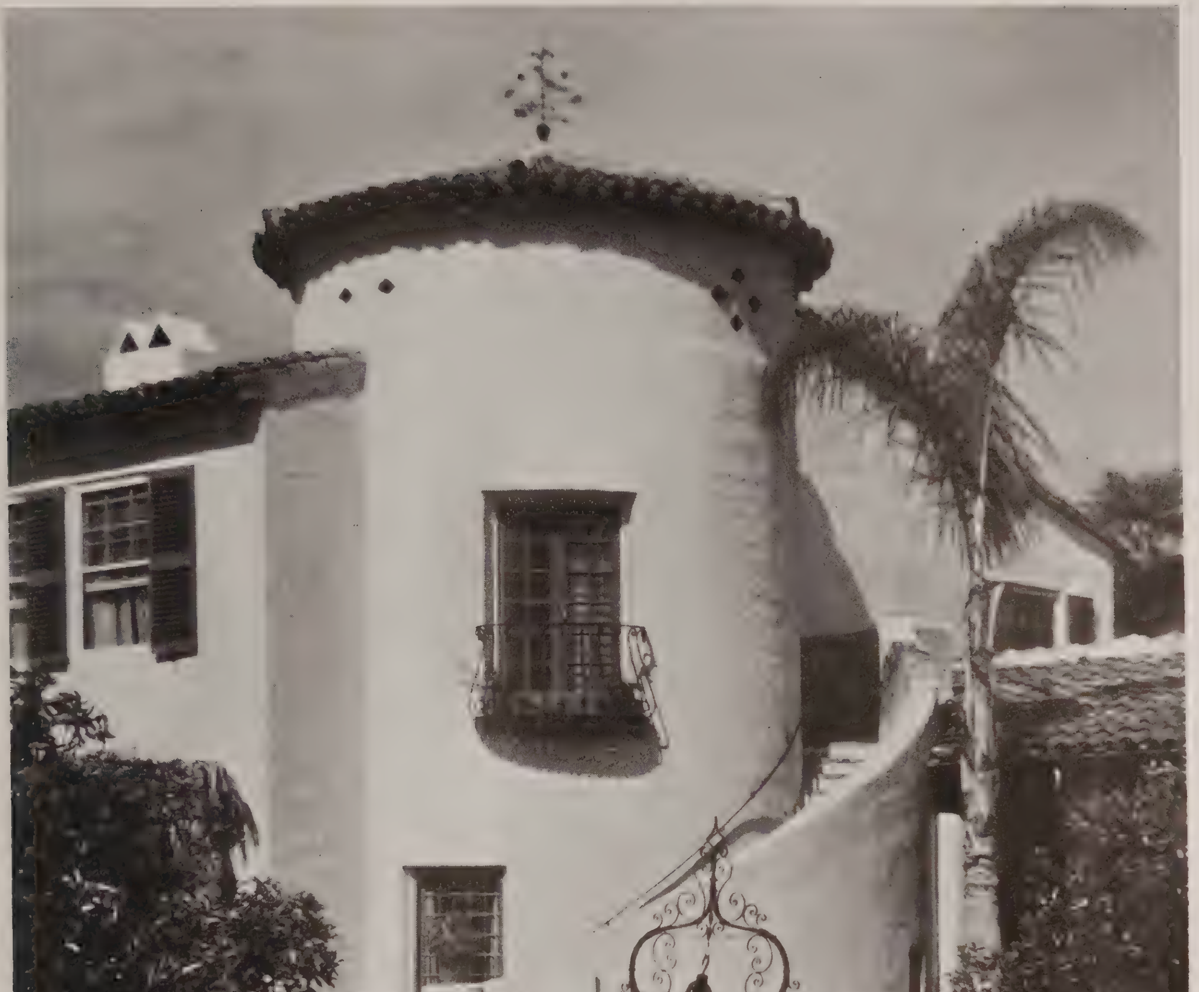
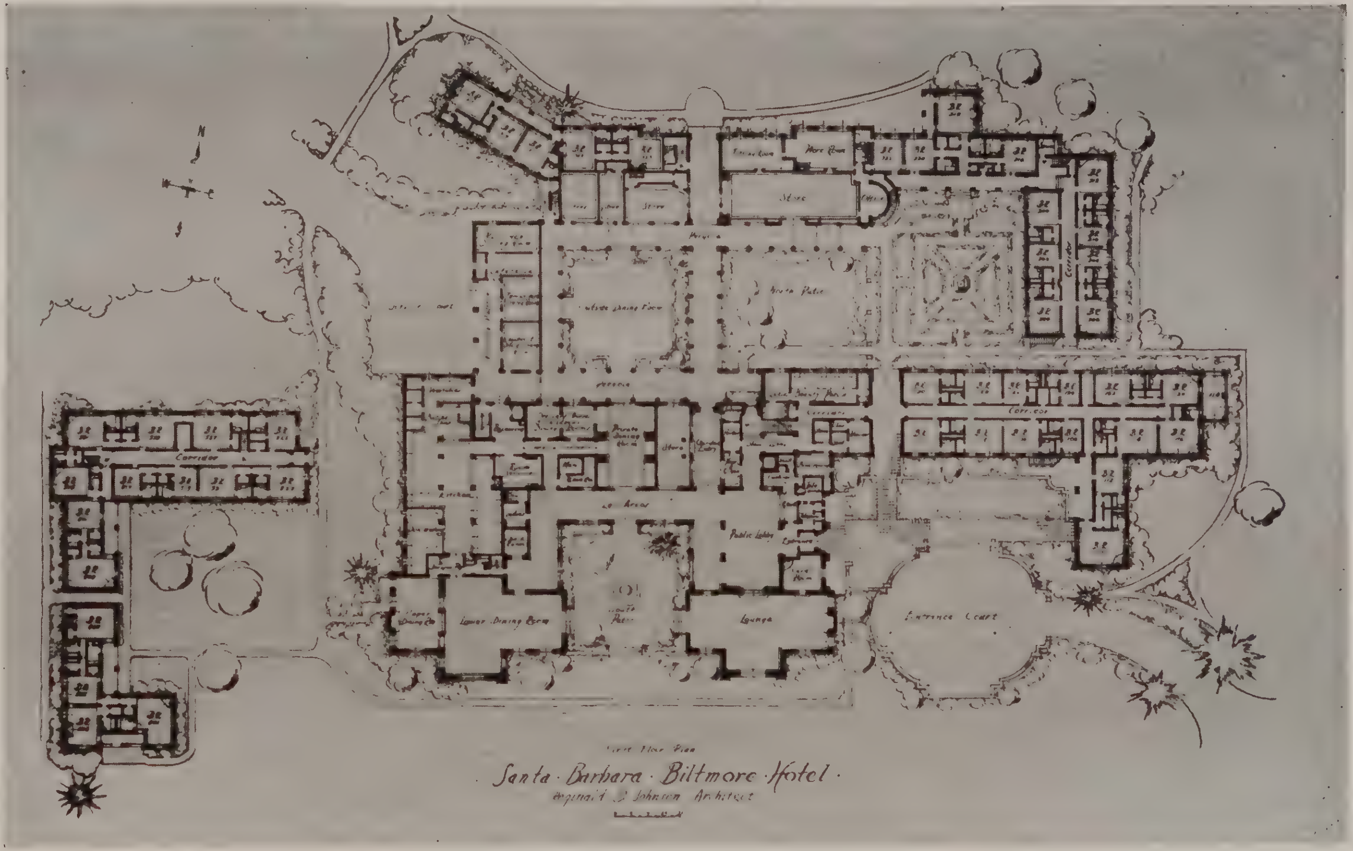


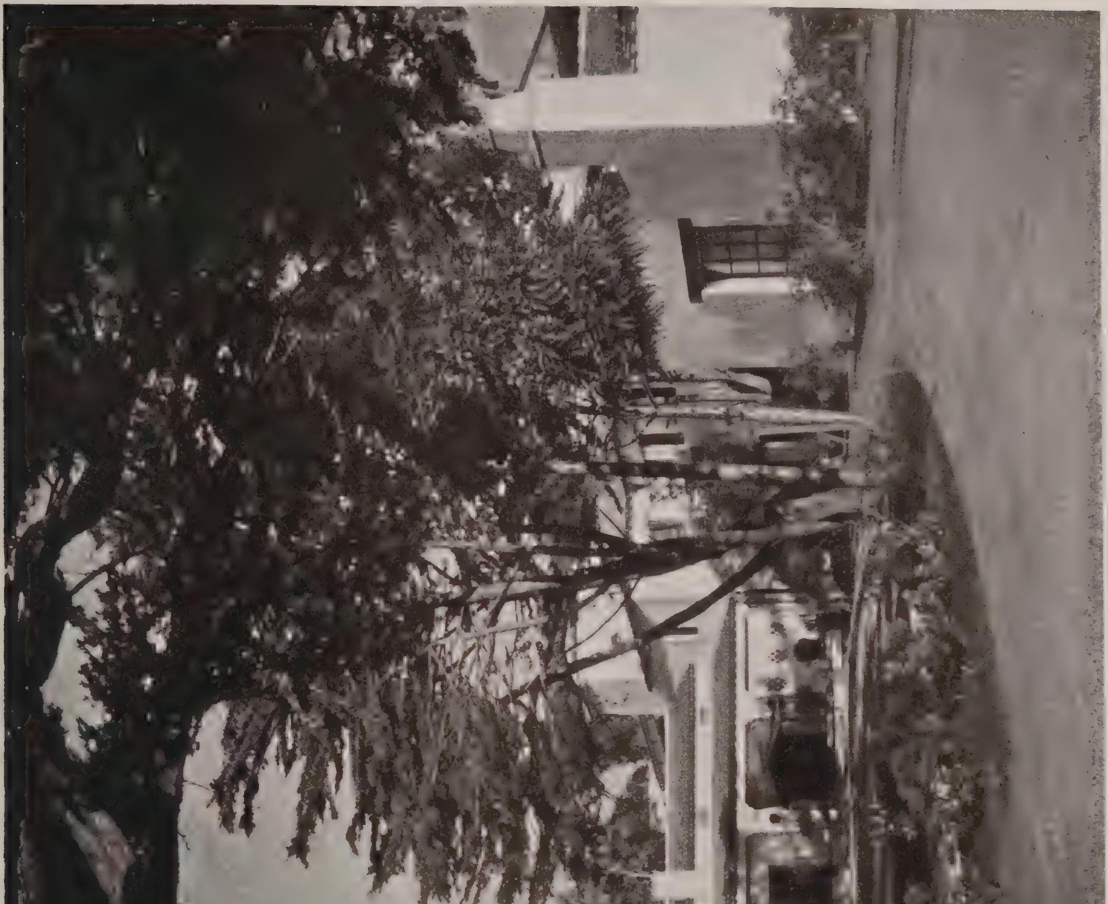
Photo. Padilla Co.

Plan on Back

SANTA BARBARA BILTMORE HOTEL
REGINALD D. JOHNSON, ARCHITECT

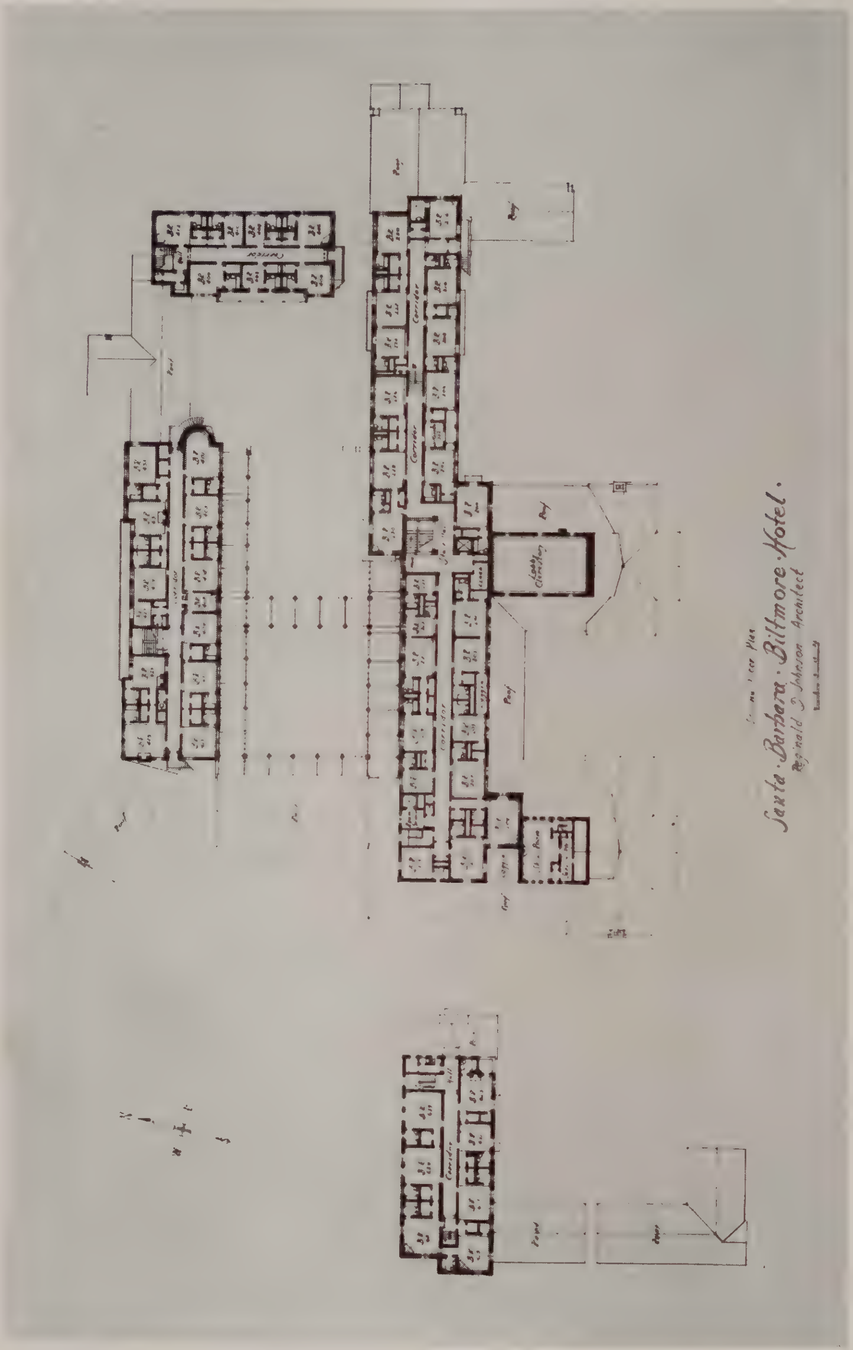


PLAN. SANTA BARBARA BILTMORE HOTEL
REGINALD D. JOHNSON, ARCHITECT



Plans on Back

ENTRANCE COURT
SANTA BARBARA BILTMORE HOTEL
REGINALD D. JOHNSON, ARCHITECT


Santa · Barbara · Biltmore · Hotel ·
Reginald D. Johnson Architect

PLAN. SANTA BARBARA BILTMORE HOTEL
REGINALD D. JOHNSON, ARCHITECT

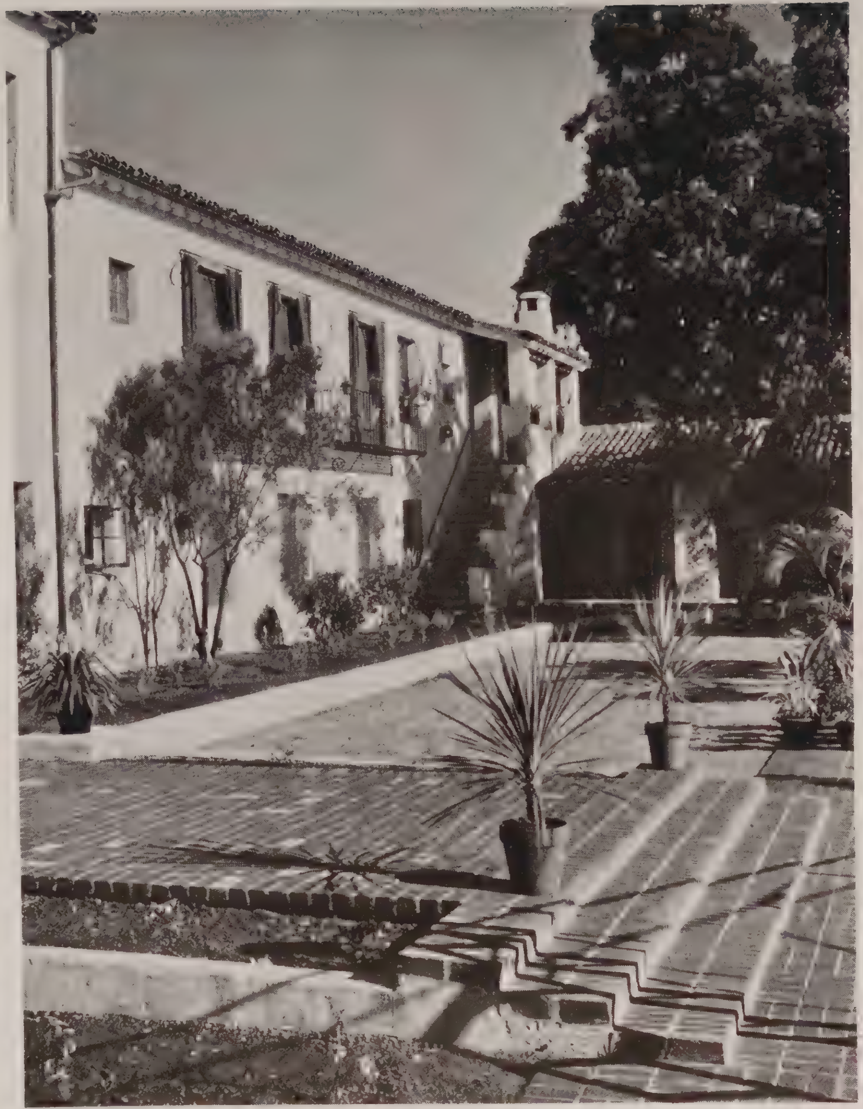


Photo. Keystone Photo. Service

FRONT TERRACE

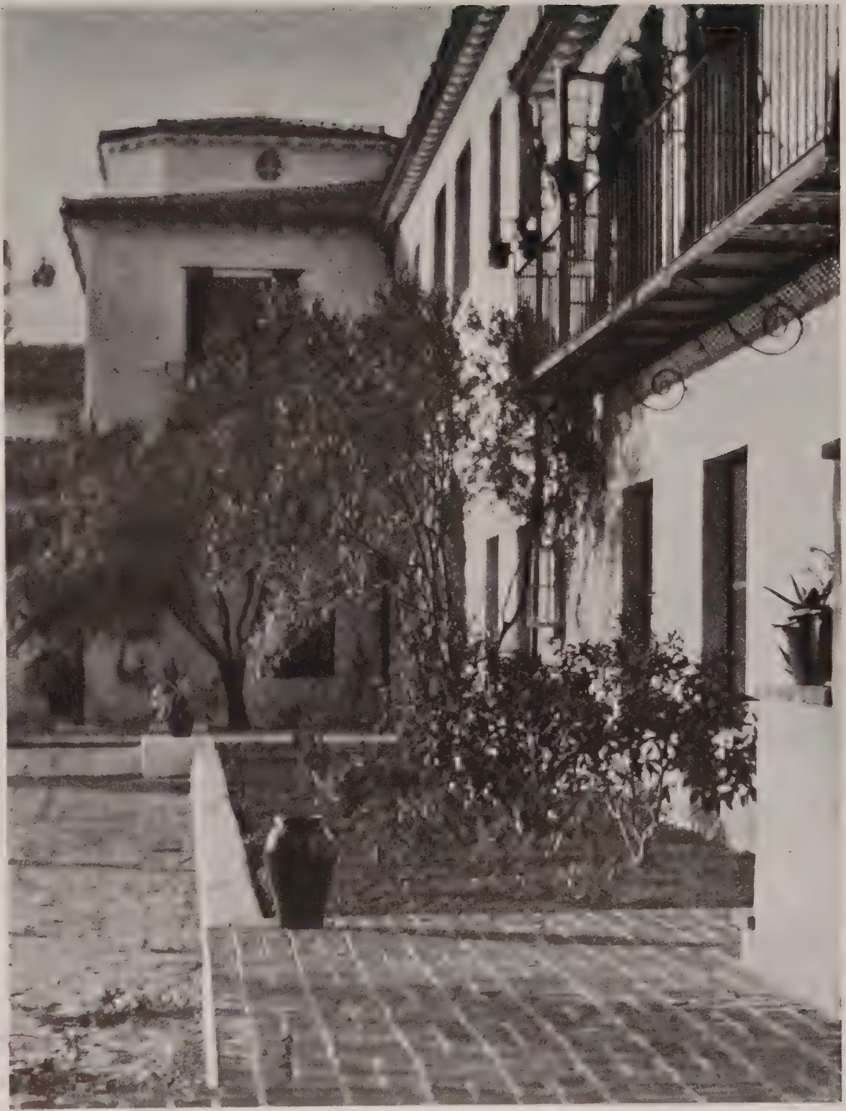


Photo. J. Walter Collinge

SOUTH FACADE

SANTA BARBARA BILTMORE HOTEL
REGINALD D. JOHNSON, ARCHITECT

COST AND CONSTRUCTION DATA

Year of completion: 1927.

Type of construction: Main building, reinforced concrete; cottages, frame construction, tile roofs.

Exterior materials: Main building, reinforced concrete; cottages, plaster.

Interior materials: Main building, plaster; cottages, plaster.

Floors: Wood and tile.

Windows: Steel sash.

Lighting: Conduit.

Heating: Steam.

Ventilating: Mechanical ventilation in principal public rooms and kitchen.

Number of guest rooms: 120, including main building, annex and cottages.

Number of bathrooms: 120, including main building, annex and cottages.

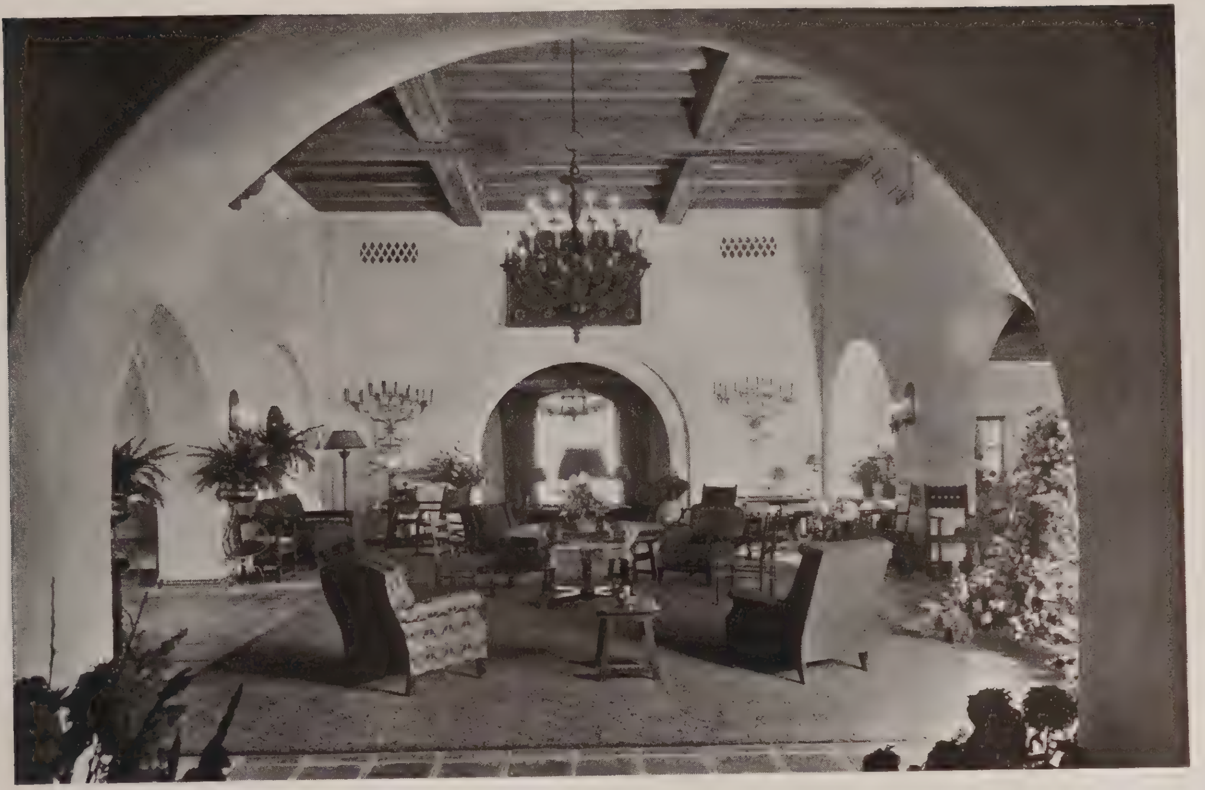
Capacity of dining room: 300 persons.

Number of cubic feet: 232,831, including main building, annex and cottages.

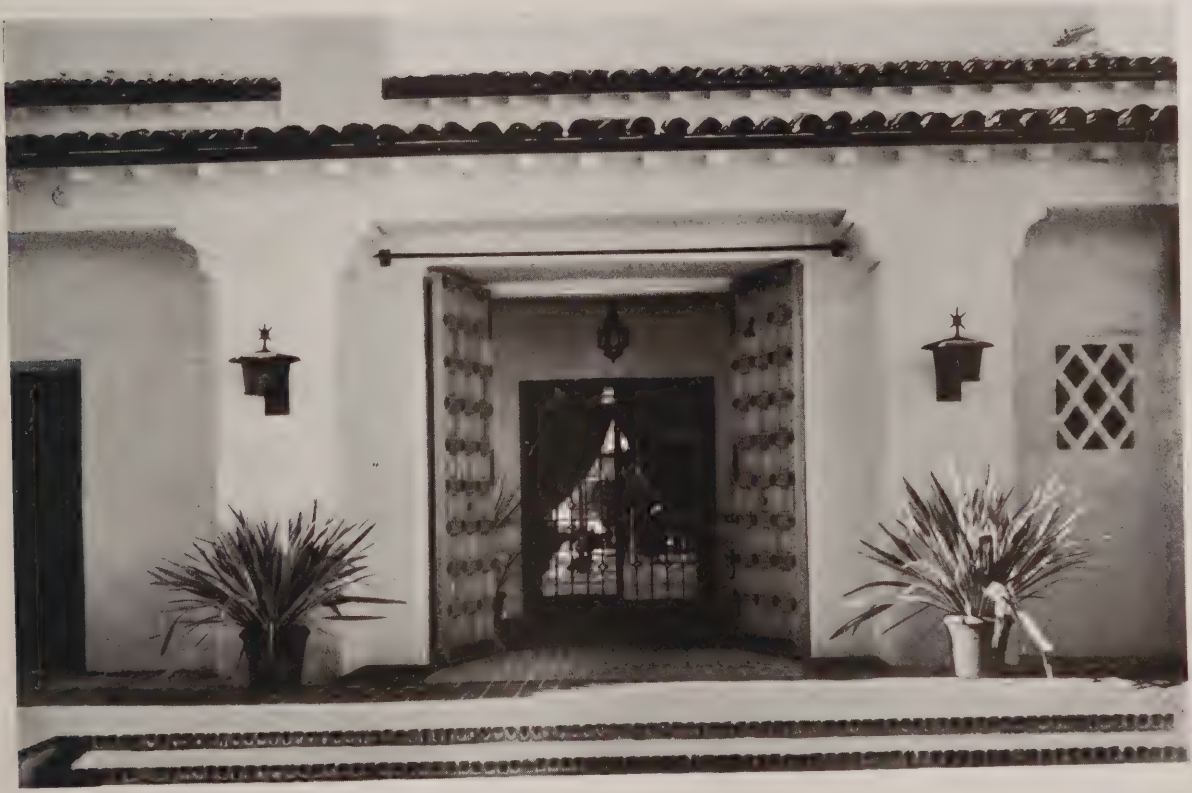
Cubic foot cost: Main building, 50 cents; frame buildings, 39 cents.

SANTA BARBARA BILTMORE HOTEL

REGINALD D. JOHNSON, ARCHITECT



LOBBY



MAIN ENTRANCE

SANTA BARBARA BILTMORE HOTEL

REGINALD D. JOHNSON, ARCHITECT

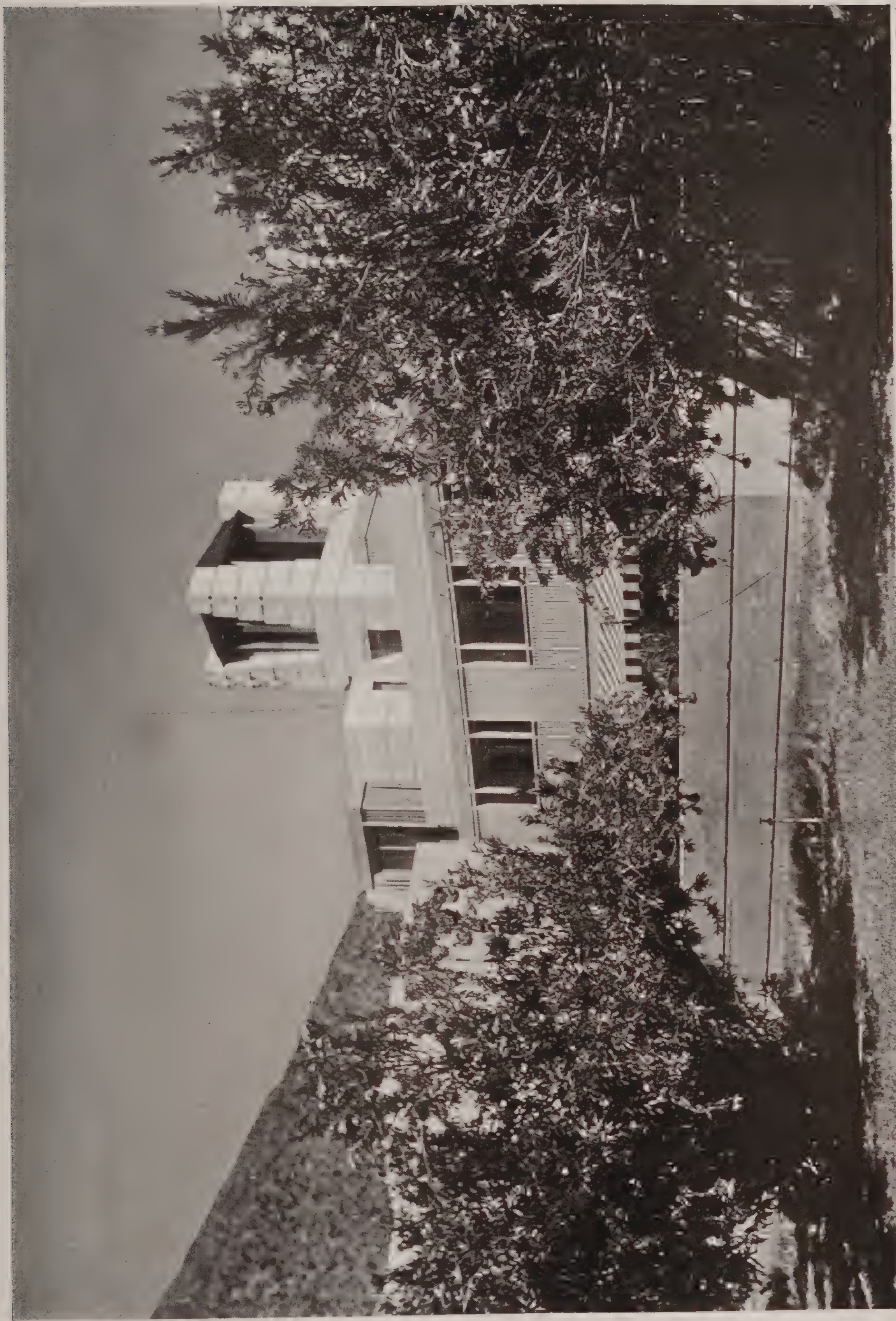


Photo. Will Connell

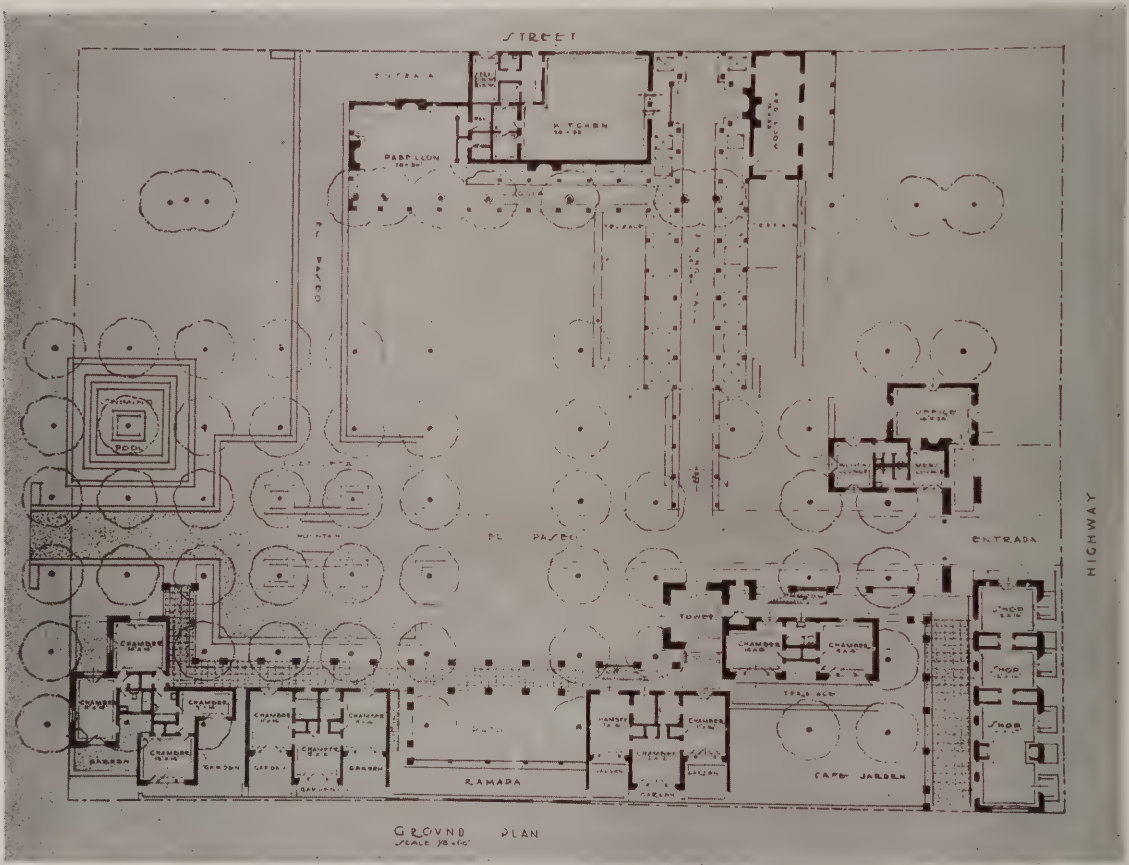
Plans on Back

OASIS HOTEL, PALM SPRINGS, CAL.

LLOYD WRIGHT, ARCHITECT

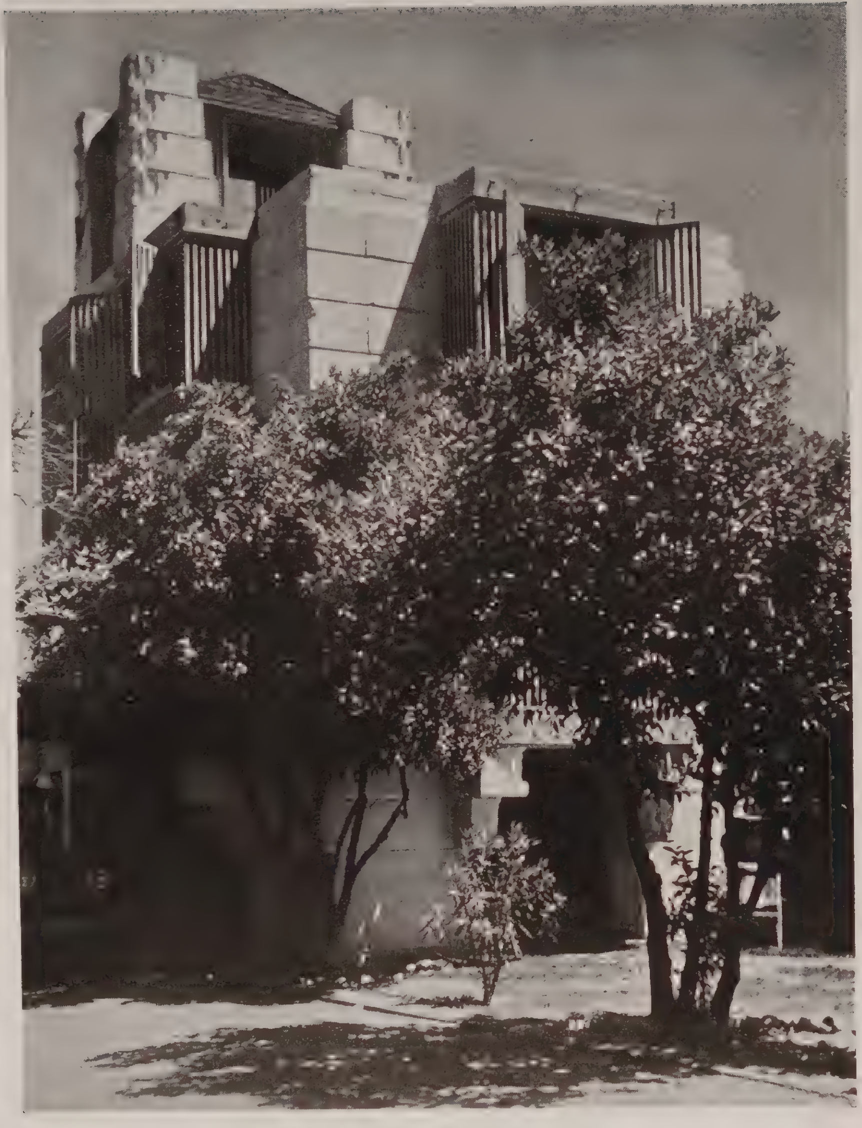
COST AND CONSTRUCTION DATA

Year of Completion: 1924. Additions, 1925.
Type of Construction: Reinforced concrete, dry tamped in slip forms invented by the architect for the purpose. Dining room and grills dressed redwood, interior and exterior.
Roofs: Cement slab terraces.
Interior Materials: Cast concrete face as left by forms; decorative joint lines inside and out.
Floors: Concrete.
Windows: Pine, all combination screen and glass; French doors.
Lighting: Electric bracket iron fixtures.
Heating: Electric wall heaters.
Ventilation: Natural cross ventilation; all outside rooms open on two or more sides.
Number of Guest Rooms: 22; with additions, total 50
Number of Baths: 14; with additions, total 35.
Cubic Foot Cost: First unit as illustrated, 42 cents.
Total Cost: First unit as illustrated, $65,000.

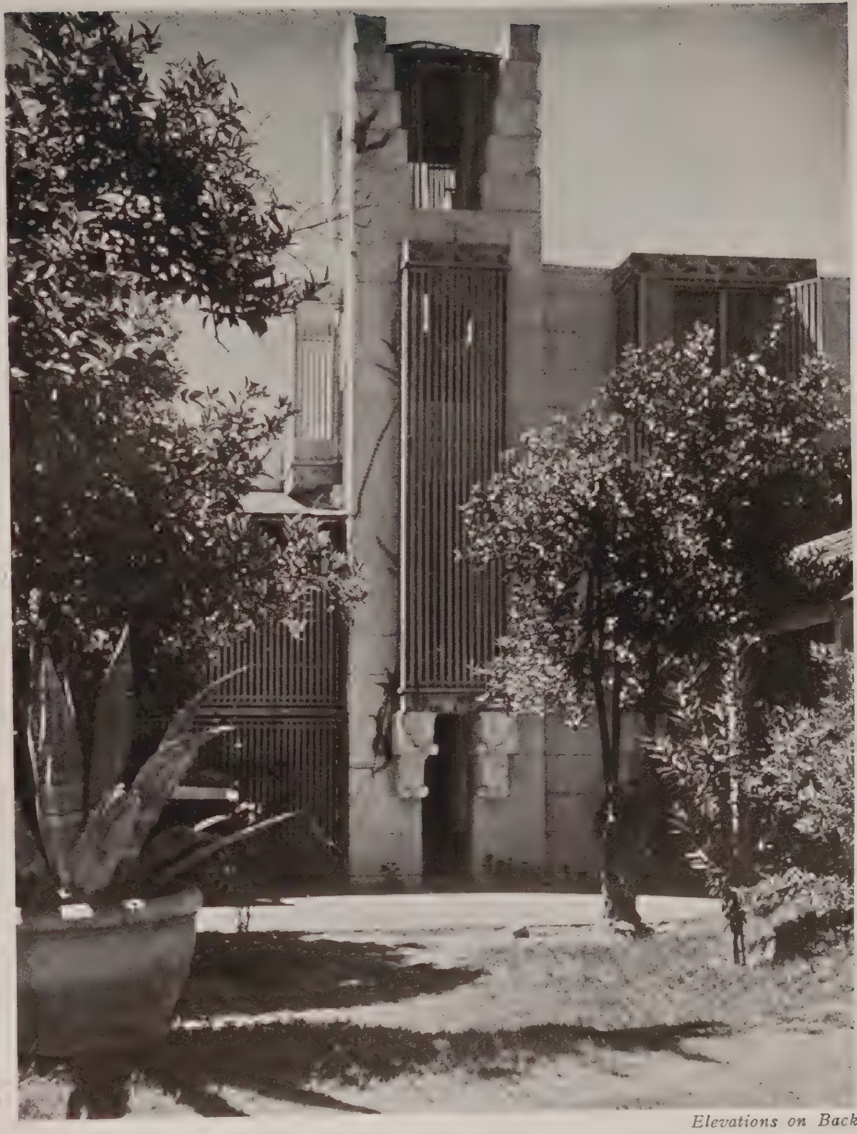


FIRST FLOOR

PLAN. OASIS HOTEL, PALM SPRINGS, CAL.
LLOYD WRIGHT, ARCHITECT



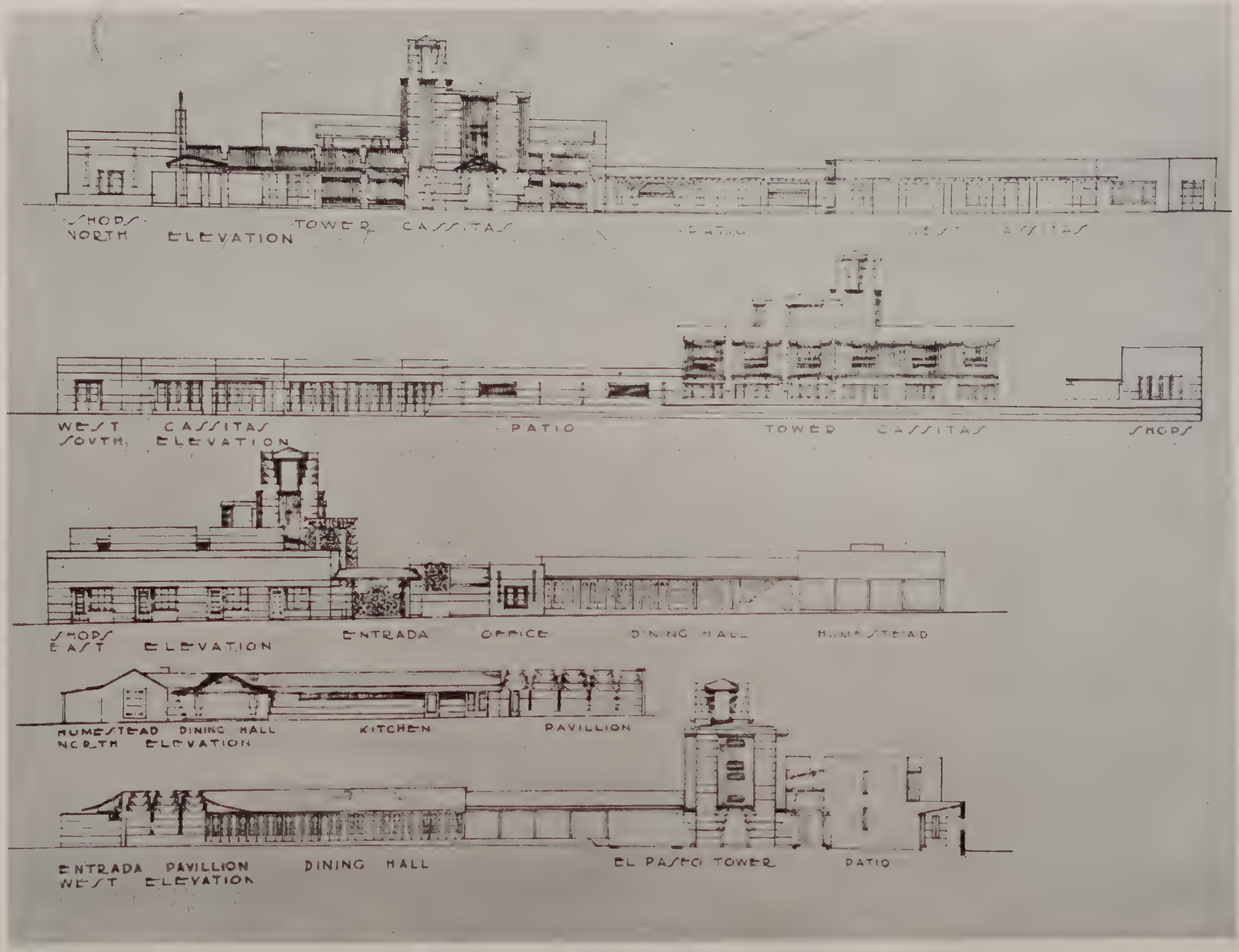
VIEW FROM PATIO



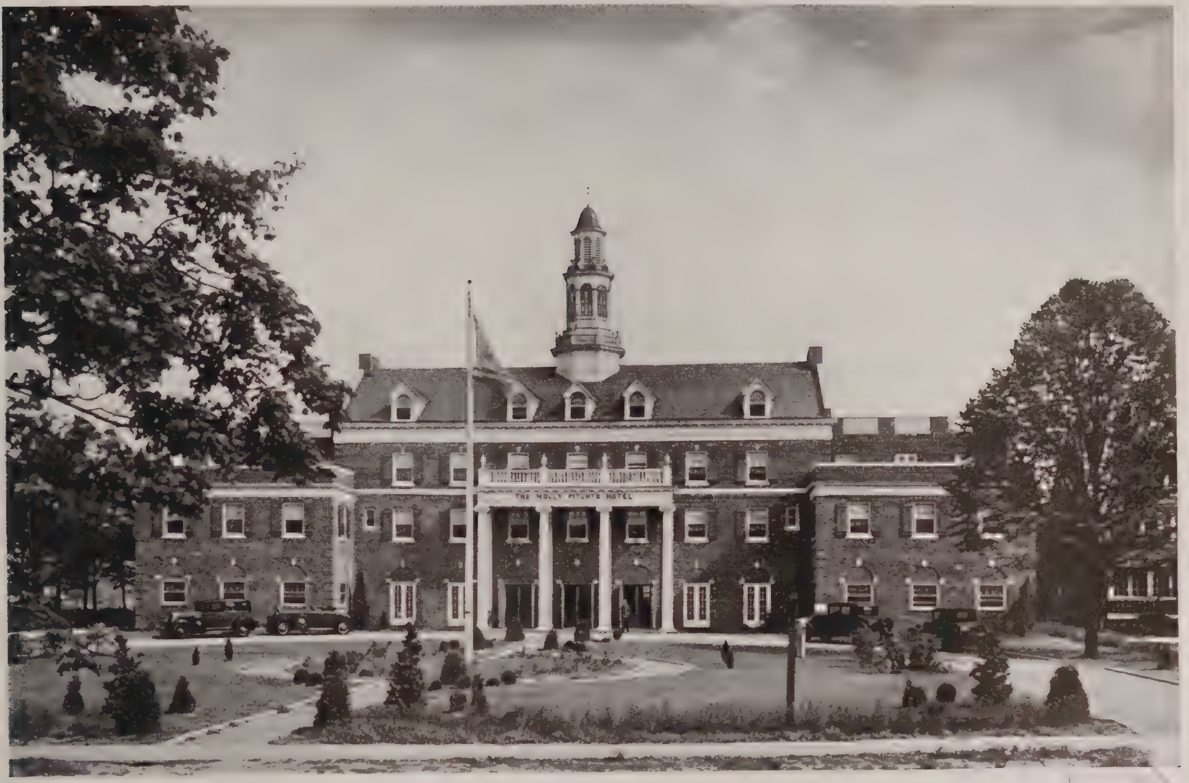
Elevations on Back

LOWER ENTRANCE

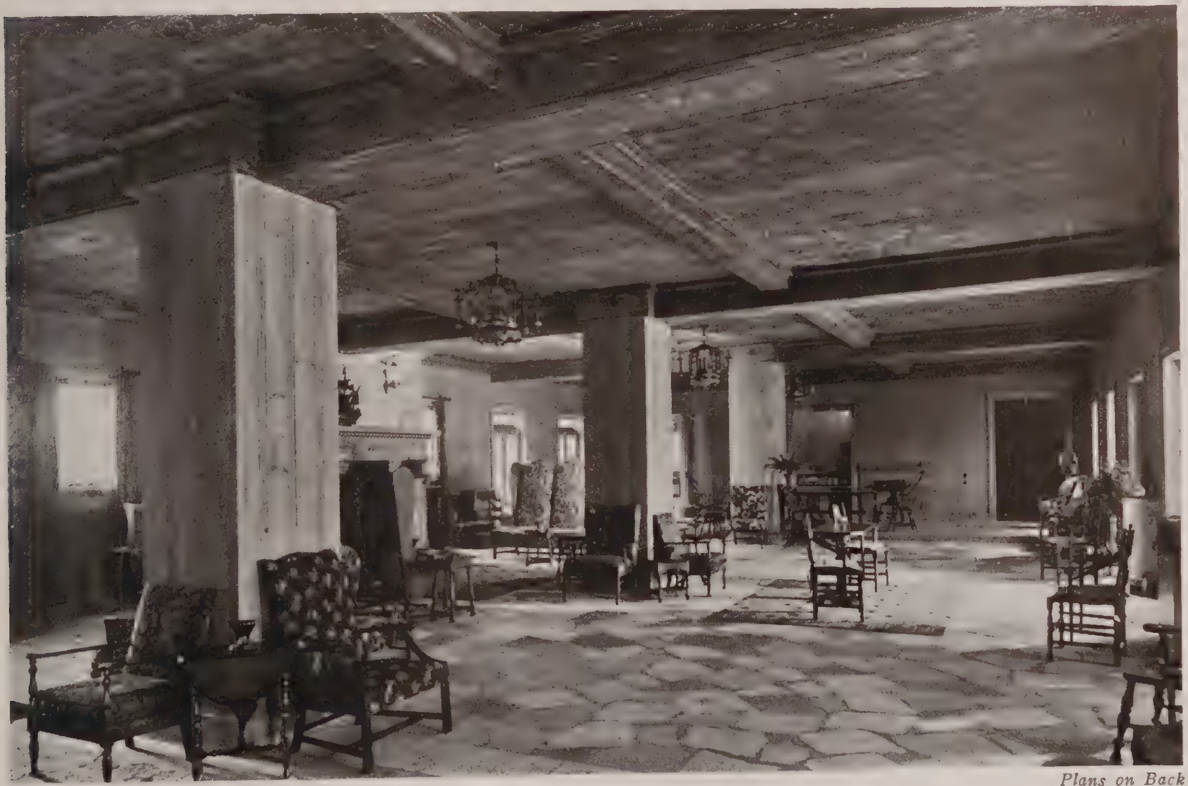
OASIS HOTEL, PALM SPRINGS, CAL.
LLOYD WRIGHT, ARCHITECT



ELEVATIONS
OASIS HOTEL, PALM SPRINGS, CAL.
LLOYD WRIGHT, ARCHITECT



GENERAL VIEW



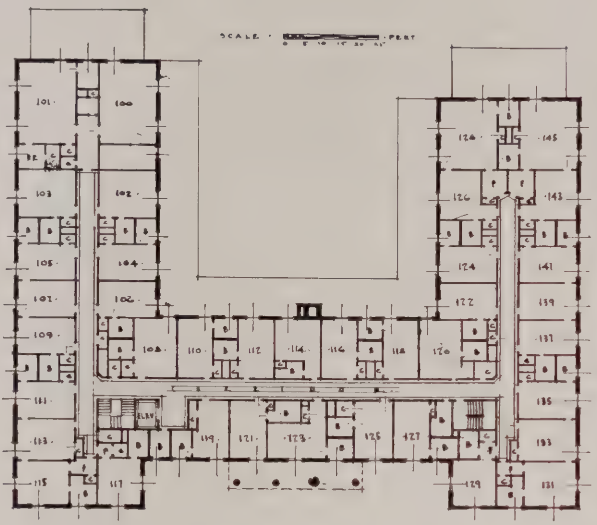
Photos. Amemya

Plans on Back

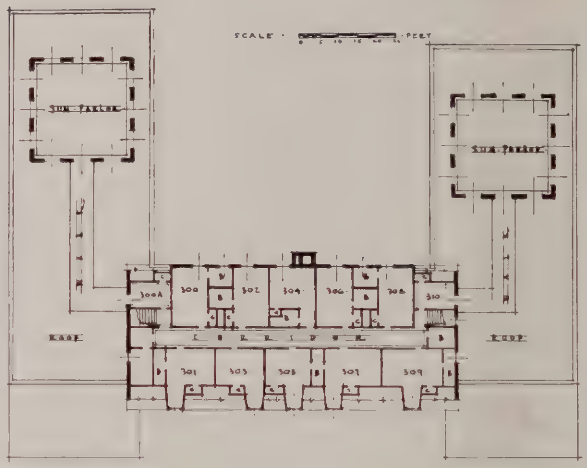
LOBBY

MOLLY PITCHER HOTEL, RED BANK, N. J.

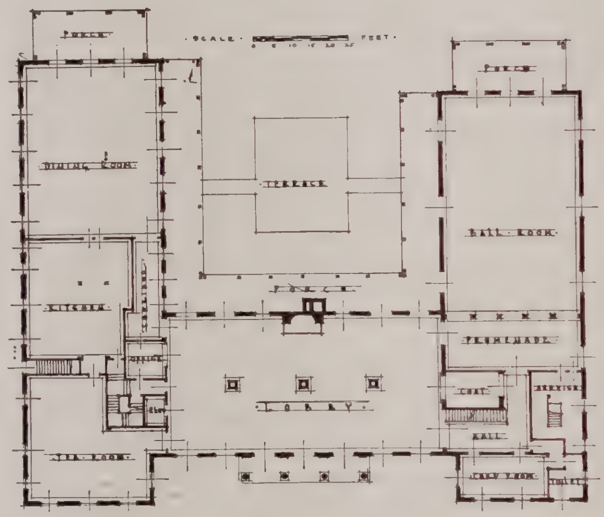
NATHAN HARRIS AND HARRIS & SOHN, ARCHITECTS



SECOND FLOOR



FOURTH FLOOR



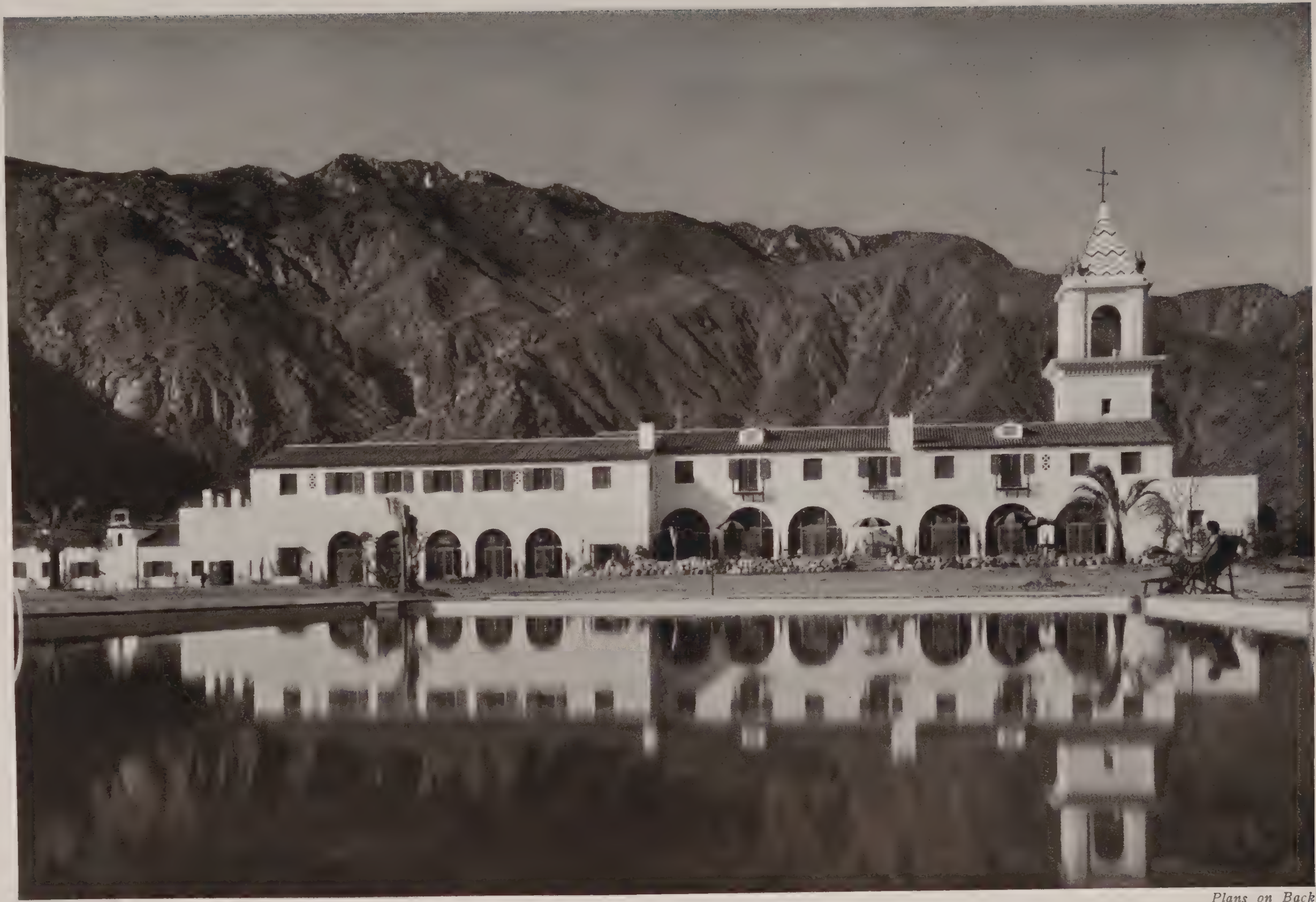
FIRST FLOOR

COST AND CONSTRUCTION DATA

Year of completion: 1929.
Type of construction: Fireproof.
Exterior materials: Brick, limestone.
Interior materials: Knotty pine, palm finish plaster, ornamental plaster.
Floors: Oak.
Windows: Double-hung.
Lighting: Electric.
Heating: Vacuum system.
Ventilating: Automatic.
Number of guest rooms: 96.
Number of baths: 80.
Capacity of dining room: 235.
Capacity of ball room: 350.
Number of cubic feet: 490,000.
Cubic foot cost: 70 cents.
Total cost: $425,000.

PLANS. MOLLY PITCHER HOTEL, RED BANK, N. J.

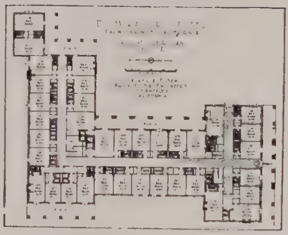
NATHAN HARRIS AND HARRIS & SOHN, ARCHITECTS

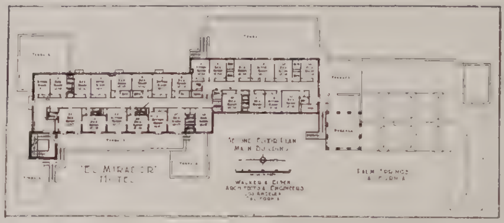


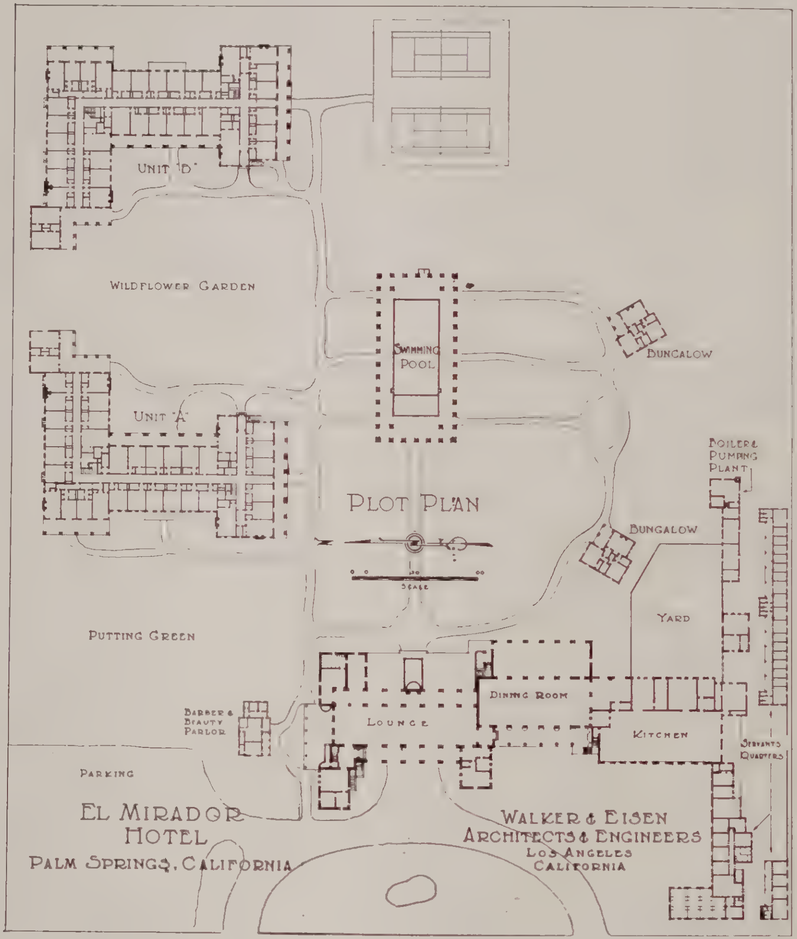
Photos. Padilla Co.

Plans on Back

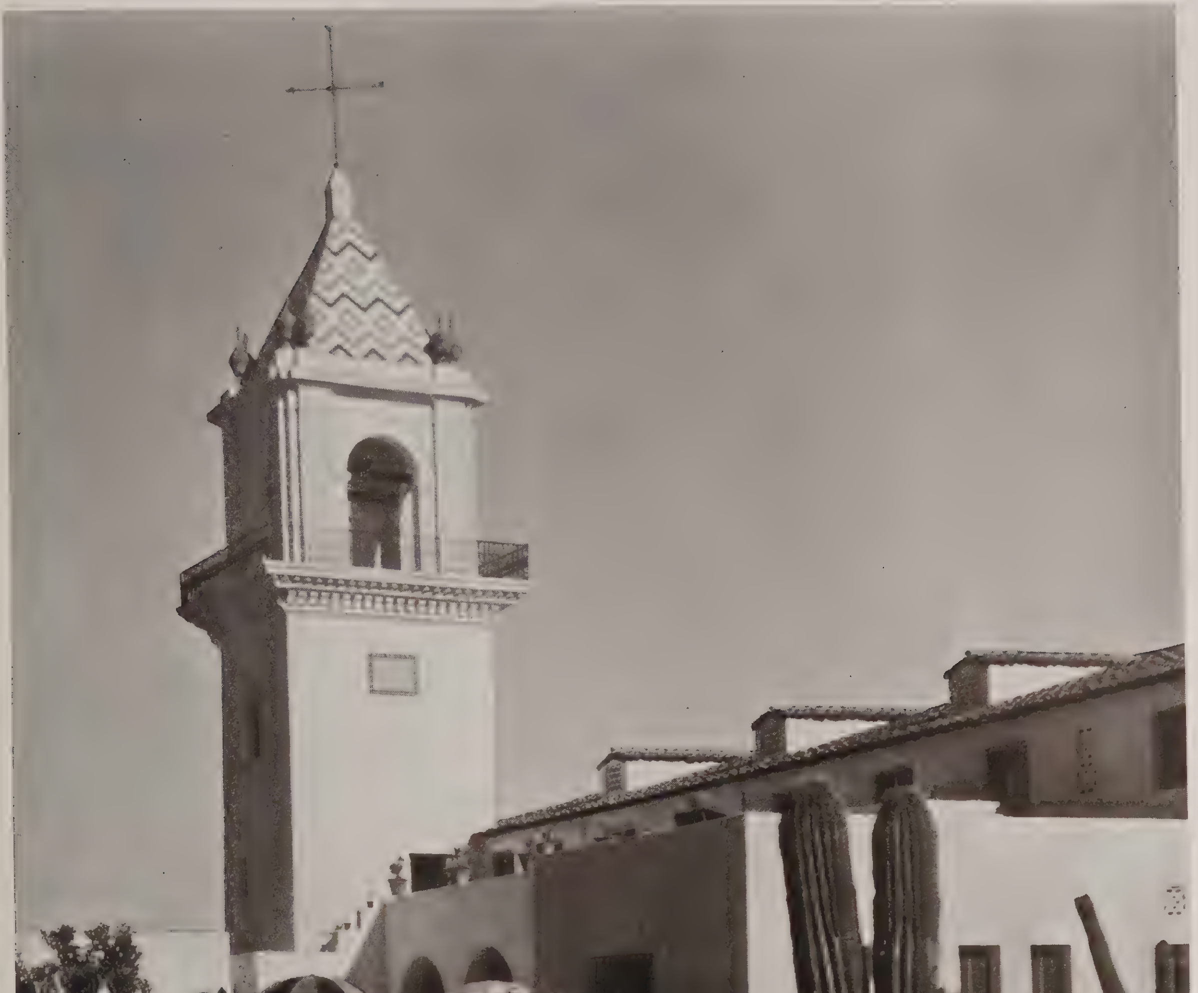
EL MIRADOR HOTEL, PALM SPRINGS, CAL.
WALKER & EISEN, ARCHITECTS







PLANS. EL MIRADOR HOTEL, PALM SPRINGS, CAL.
WALKER & EISEN, ARCHITECTS



EL MIRADOR HOTEL, PALM SPRINGS, CAL.
WALKER & EISEN, ARCHITECTS

COST AND CONSTRUCTION DATA

Year of completion: 1927.

Type of construction: Class C.

Exterior materials: Stucco.

Interior materials: Wood studs, composition lath and plaster.

Floors: Wood.

Windows: Wood.

Lighting: Electric.

Heating: Steam.

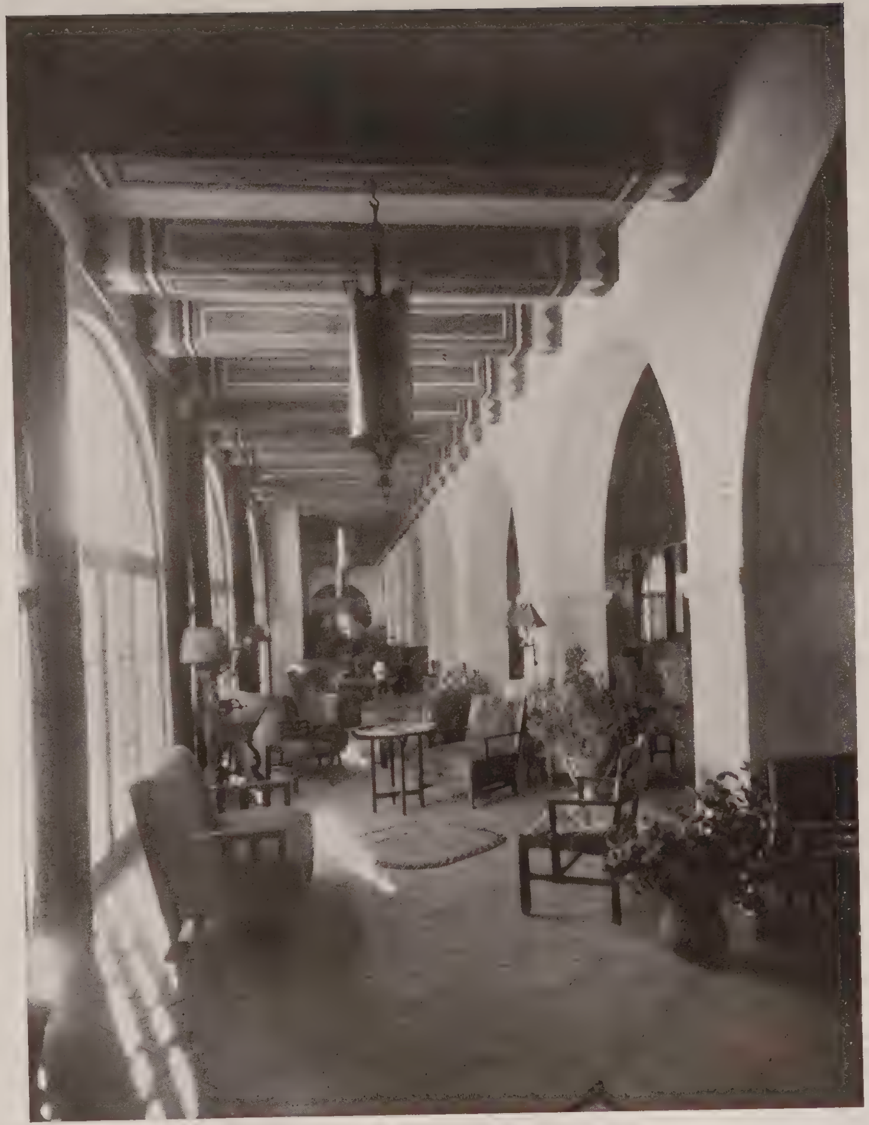
Number of guest rooms: 165.

Number of baths, 165.

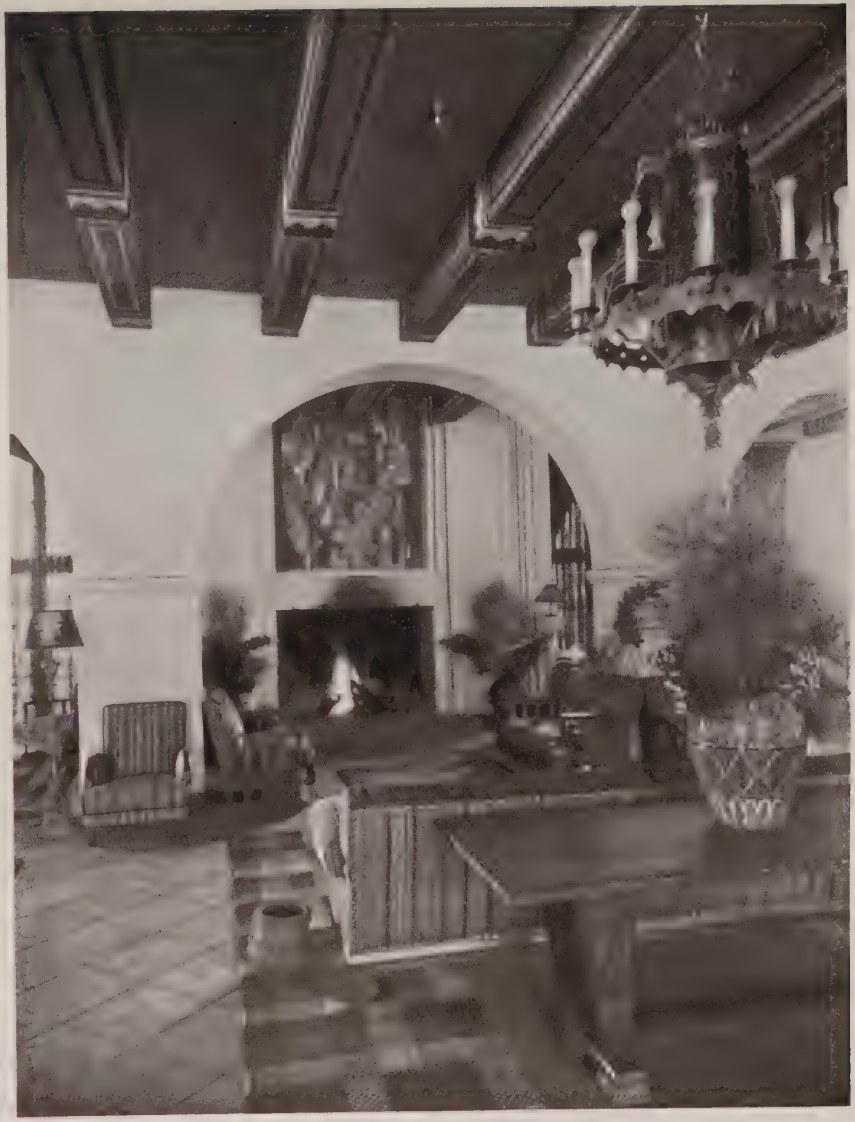
Cubic foot cost: 52 cents.

Total cost: $600,000.

EL MIRADOR HOTEL, PALM SPRINGS, CAL.
WALKER & EISEN, ARCHITECTS

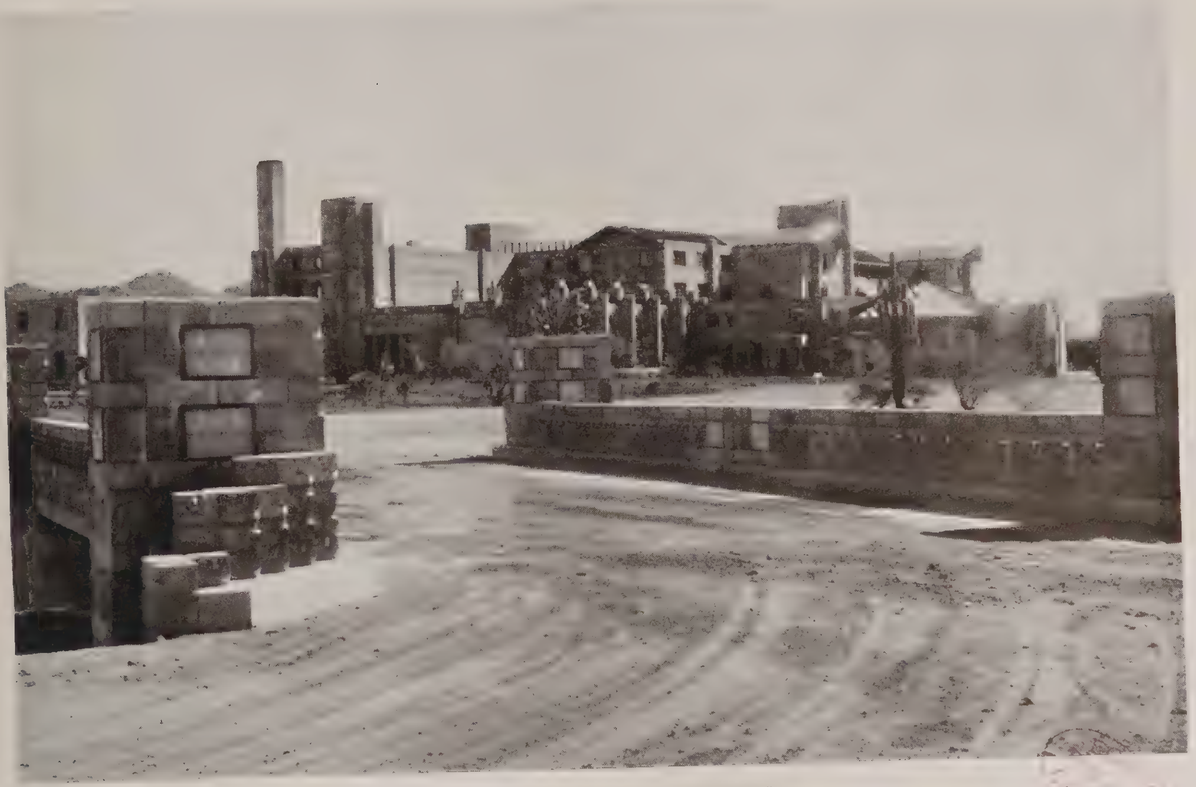


SIDE OF LOUNGE

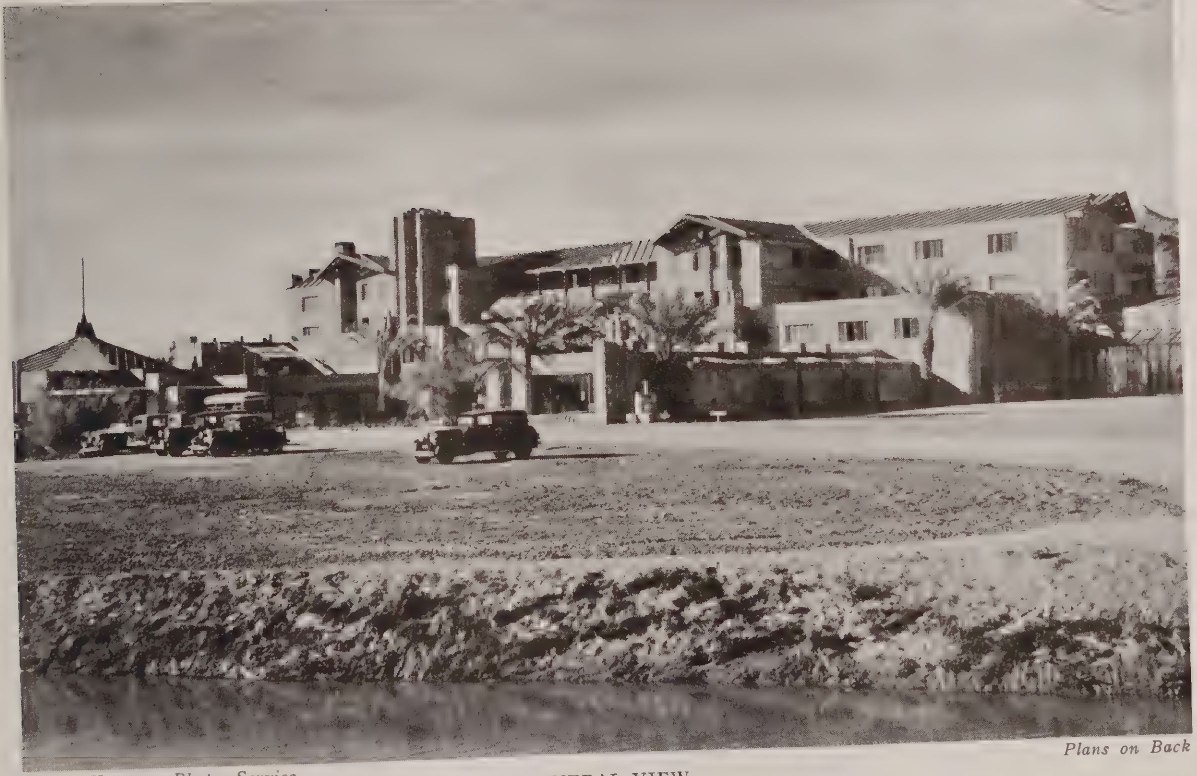


FIREPLACE IN LOUNGE

EL MIRADOR HOTEL, PALM SPRINGS, CAL.
WALKER & EISEN, ARCHITECTS



ENTRANCE TO HOTEL GROUNDS



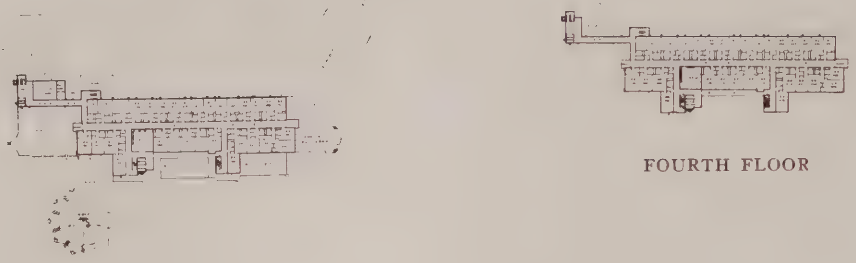
Plans on Back

Photos. Keystone Photo. Service

GENERAL VIEW

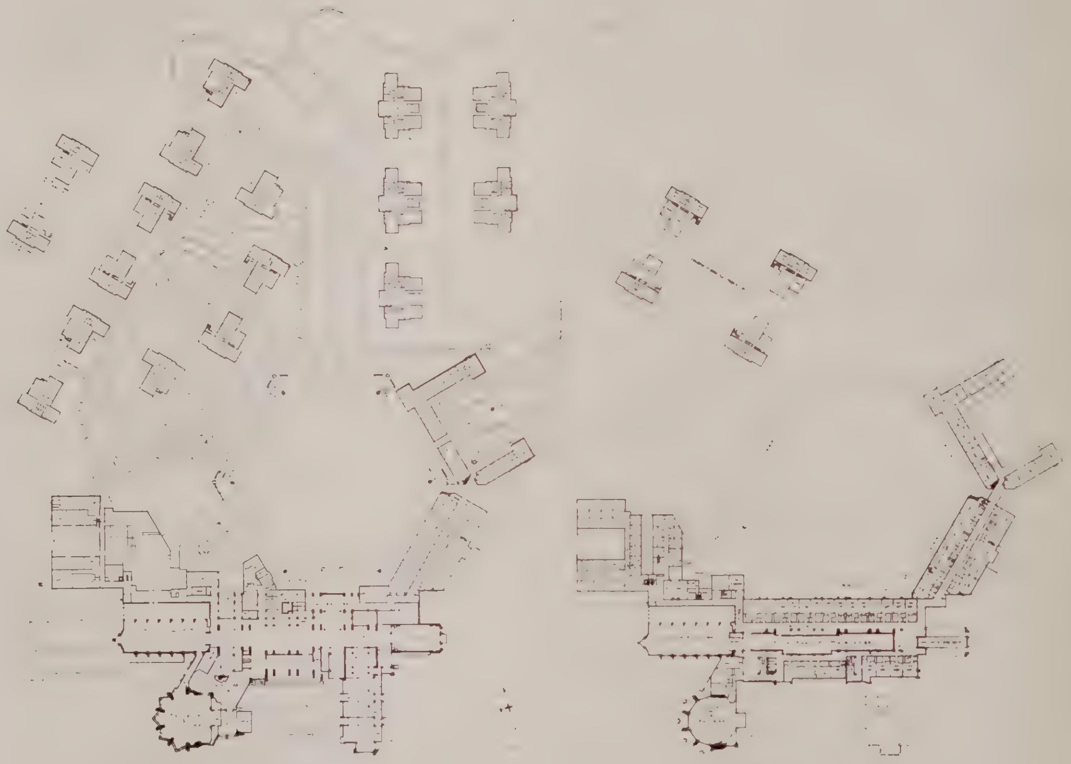
ARIZONA BILTMORE HOTEL, PHŒNIX, ARIZ.

ALBERT CHASE McARTHUR, ARCHITECT



THIRD FLOOR

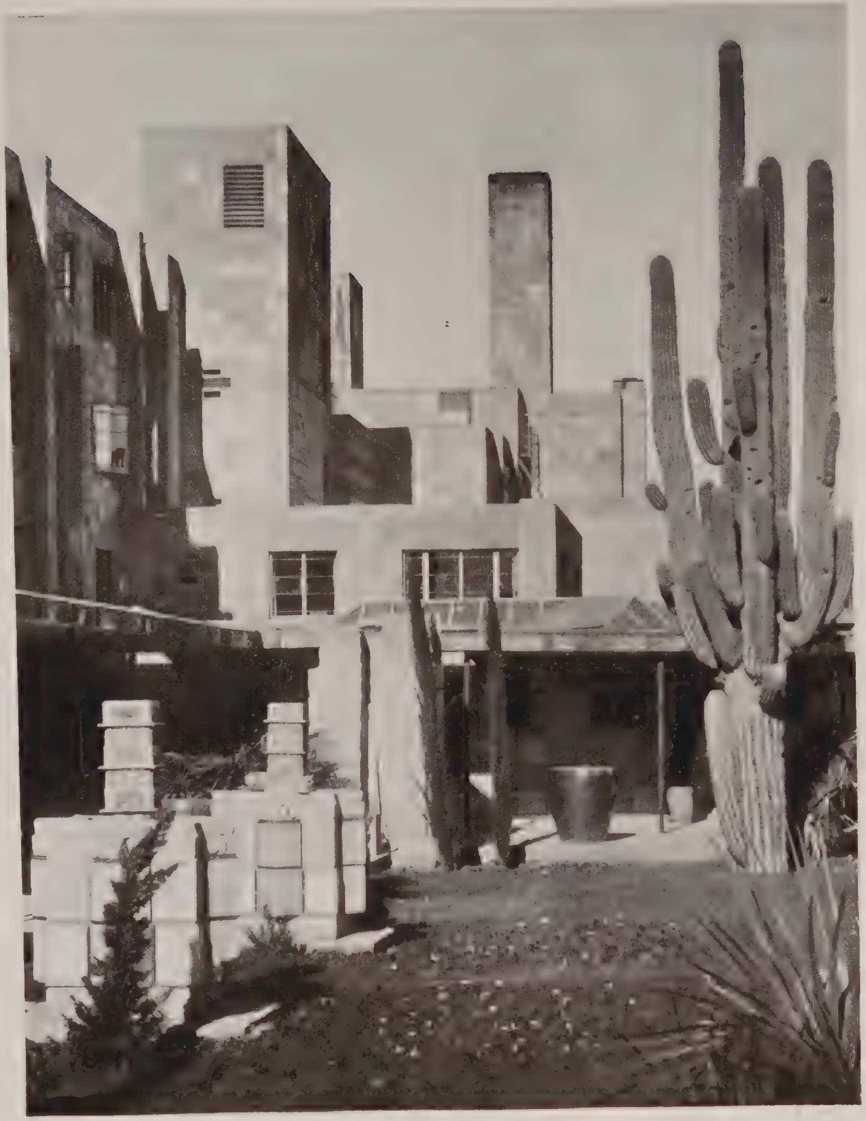
FOURTH FLOOR



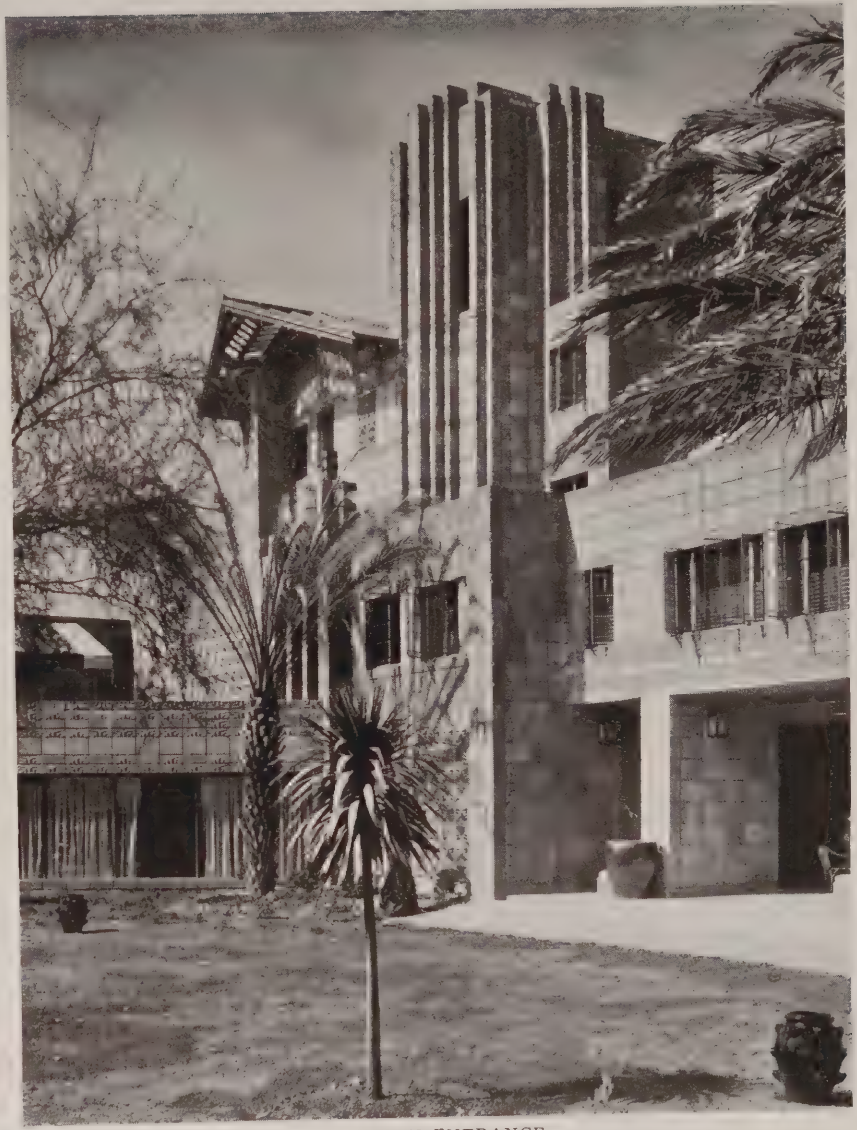
FIRST FLOOR

SECOND FLOOR

PLANS. ARIZONA BILTMORE HOTEL, PHŒNIX, ARIZ.
ALBERT CHASE McARTHUR, ARCHITECT



VIEW FROM PATIO



GARDEN ENTRANCE

ARIZONA BILTMORE HOTEL, PHŒNIX, ARIZ.
ALBERT CHASE McARTHUR, ARCHITECT

CONSTRUCTION DATA

Exterior materials: Textile Block Slab construction, invented and patented by Frank Lloyd Wright.

Interior materials: Block slabs; ceilings, plastered; guest rooms, plaster walls, ceilings finished with wax, mahogany woodwork; American walnut in public spaces.

Floors: Concrete slabs, maple dance floors in ballroom and dining room.

Lighting: By means of glass blocks with reflectors behind them set flush with concrete blocks in sheet copper frames.

Heating: High pressure boilers with steam radiators and most direct radiation.

Ventilating: Mechanically by suction.

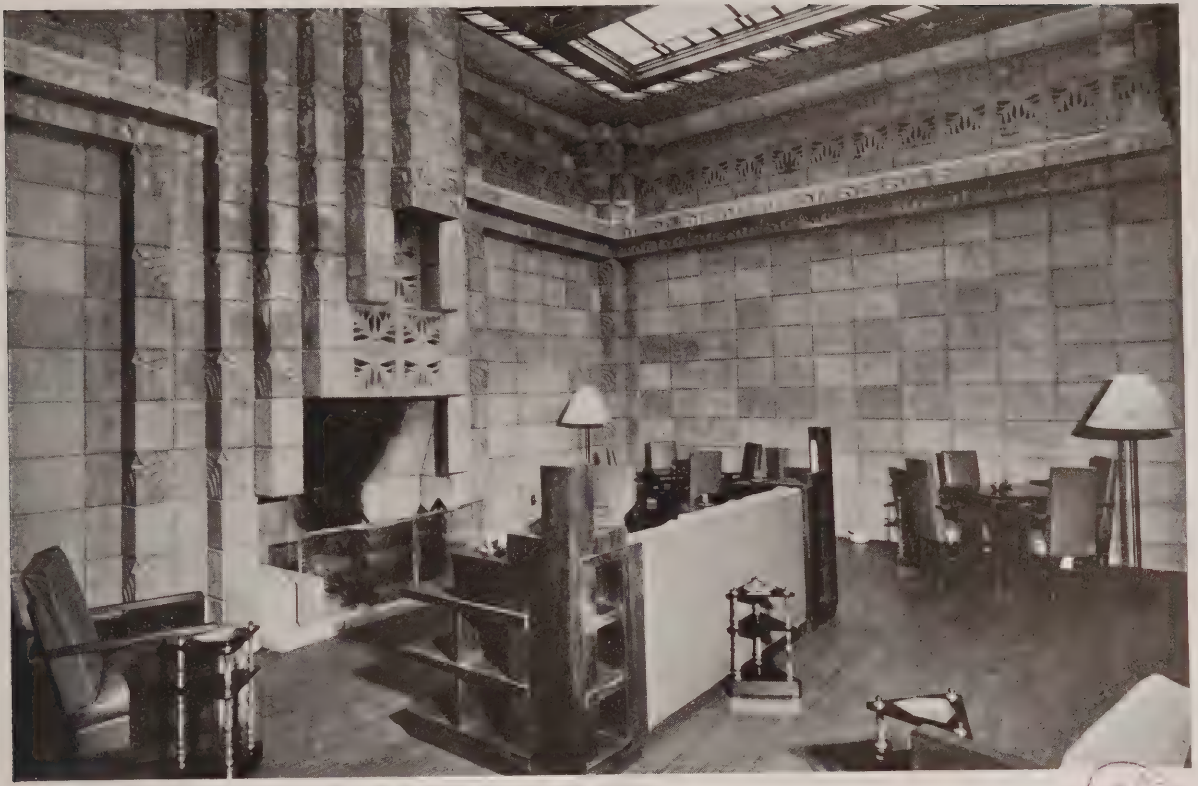
Number of guest rooms: 202, 73 of which are in 15 cottages.

Number of bathrooms: 202.

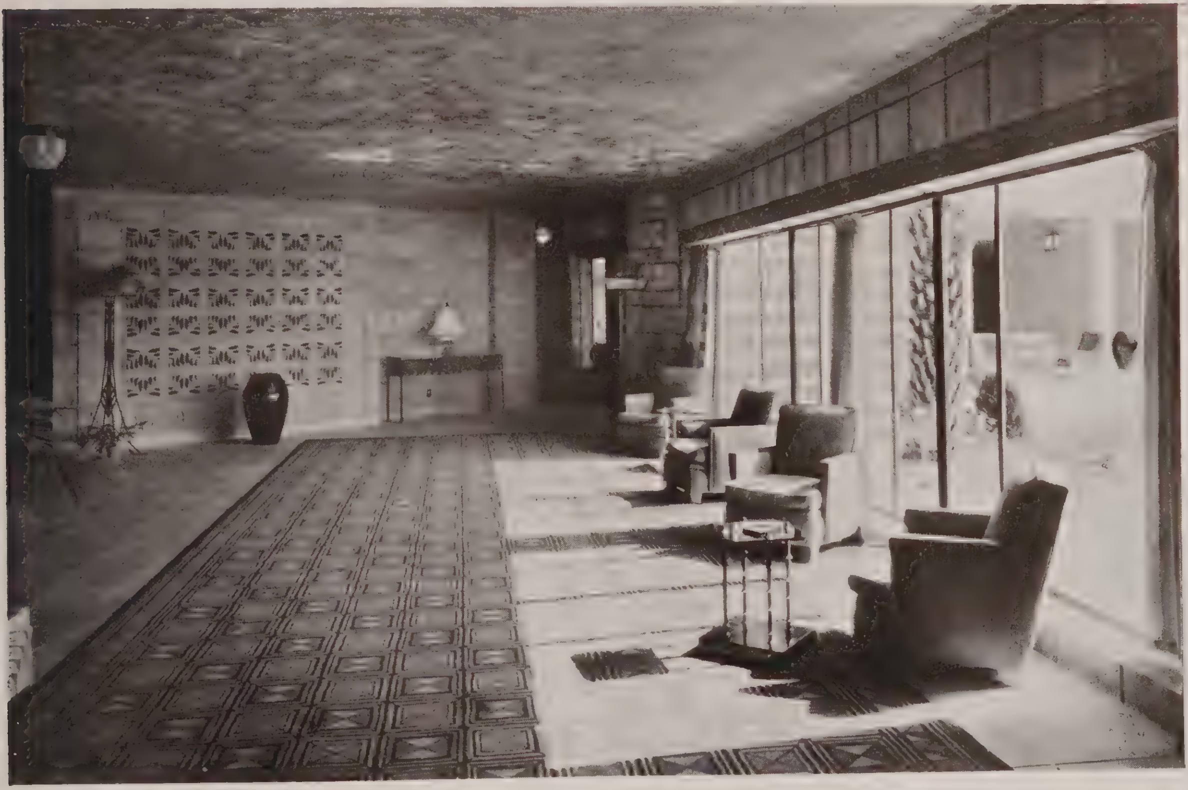
Capacity of dining rooms: 550.

Capacity of ball room: Approx. 400.

ARIZONA BILTMORE HOTEL, PHŒNIX, ARIZ.
ALBERT CHASE McARTHUR, ARCHITECT



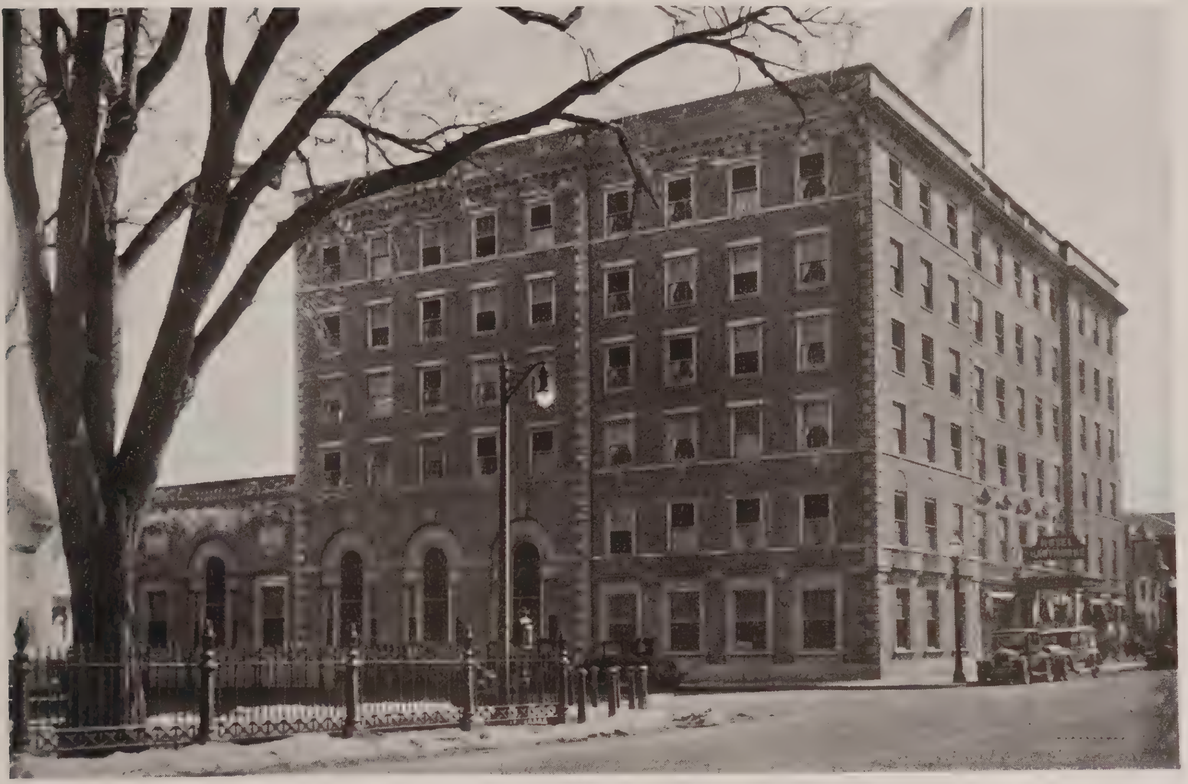
MEN'S SMOKING ROOM



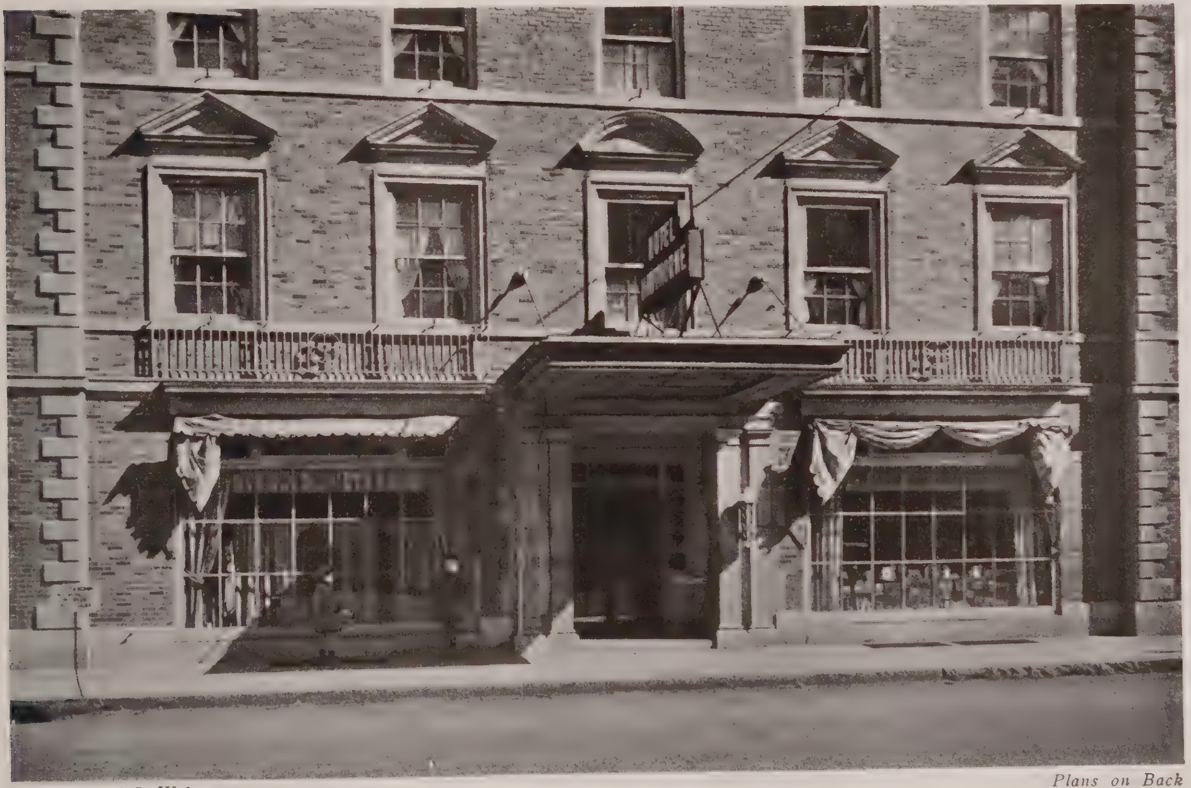
LOBBY

ARIZONA BILTMORE HOTEL, PHŒNIX, ARIZ.

ALBERT CHASE McARTHUR, ARCHITECT



GENERAL VIEW



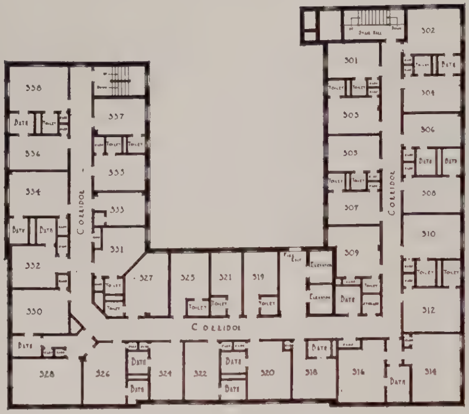
Photos. Paul J. Weber

Plans on Back

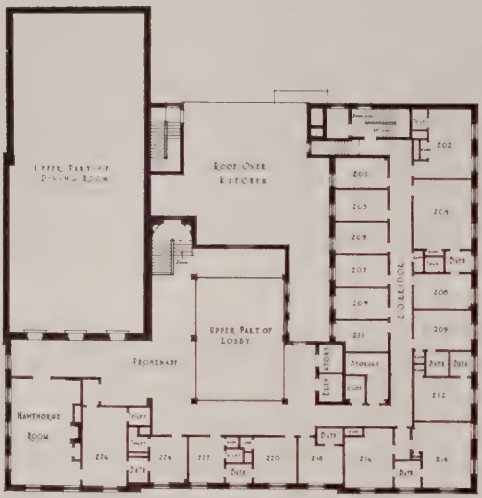
MAIN ENTRANCE

HOTEL HAWTHORNE, SALEM, MASS.

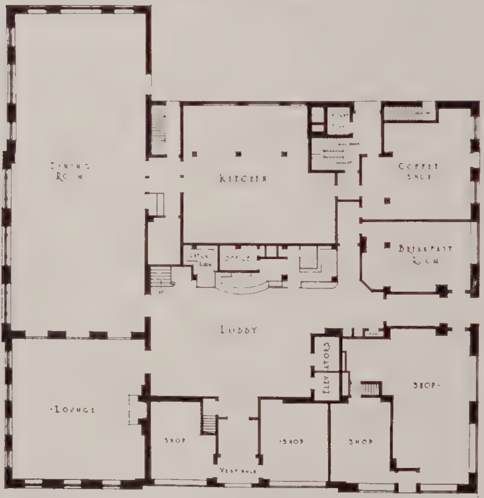
SMITH & WALKER AND H. L. STEVENS & CO., ASSOCIATED, ARCHITECTS



THIRD FLOOR

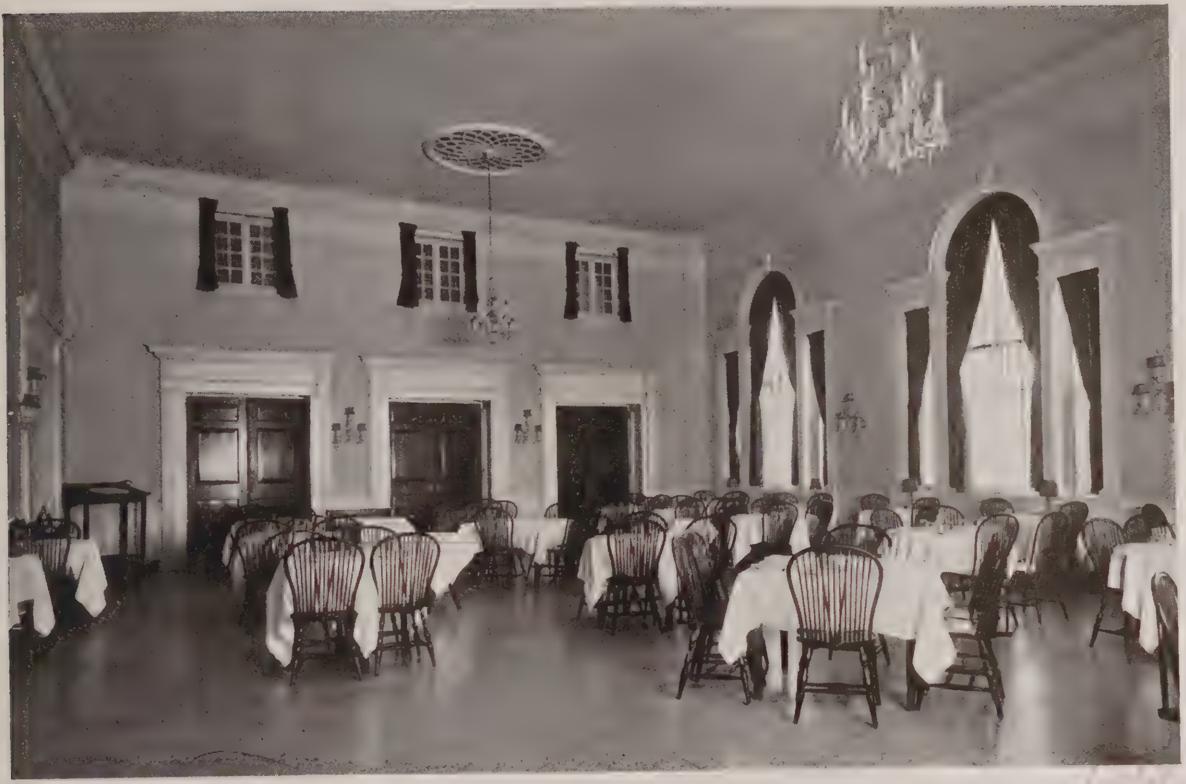


SECOND FLOOR

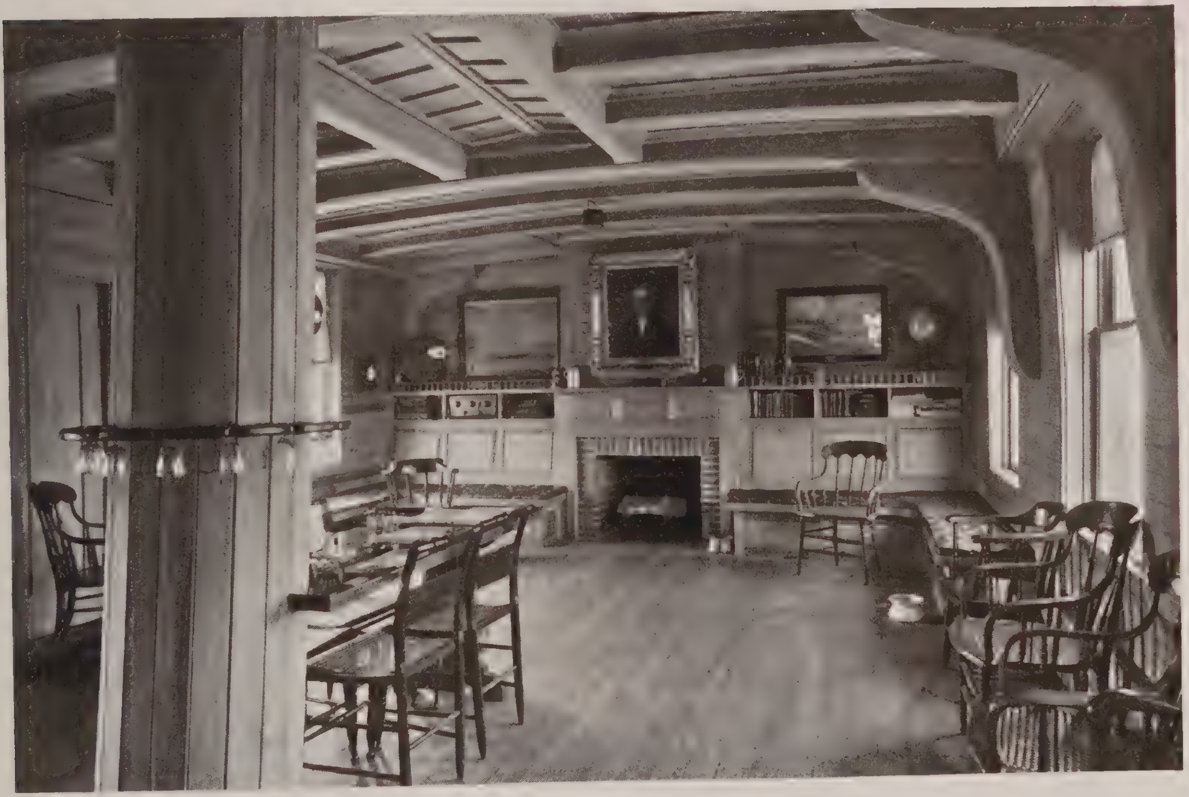


FIRST FLOOR

PLANS. HOTEL HAWTHORNE, SALEM, MASS.
SMITH & WALKER AND H. L. STEVENS & CO., ASSOCIATED, ARCHITECTS



DINING ROOM



CLUBROOM OF THE SALEM MARINE SOCIETY

HOTEL HAWTHORNE, SALEM, MASS.

SMITH & WALKER AND H. L. STEVENS & CO., ASSOCIATED, ARCHITECTS

CONSTRUCTION DATA

Type of construction: First class, brick, concrete and cast stone.

Exterior materials: Brick and cast stone.

Interior materials: Plaster and painted wood.

Floors: Terrazzo and concrete floors carpeted.

Windows: Wood, small light, colonial double-hung.

Lighting: Direct electric special and stock fixtures.

Heating: Steam.

Ventilation: Gravity system.

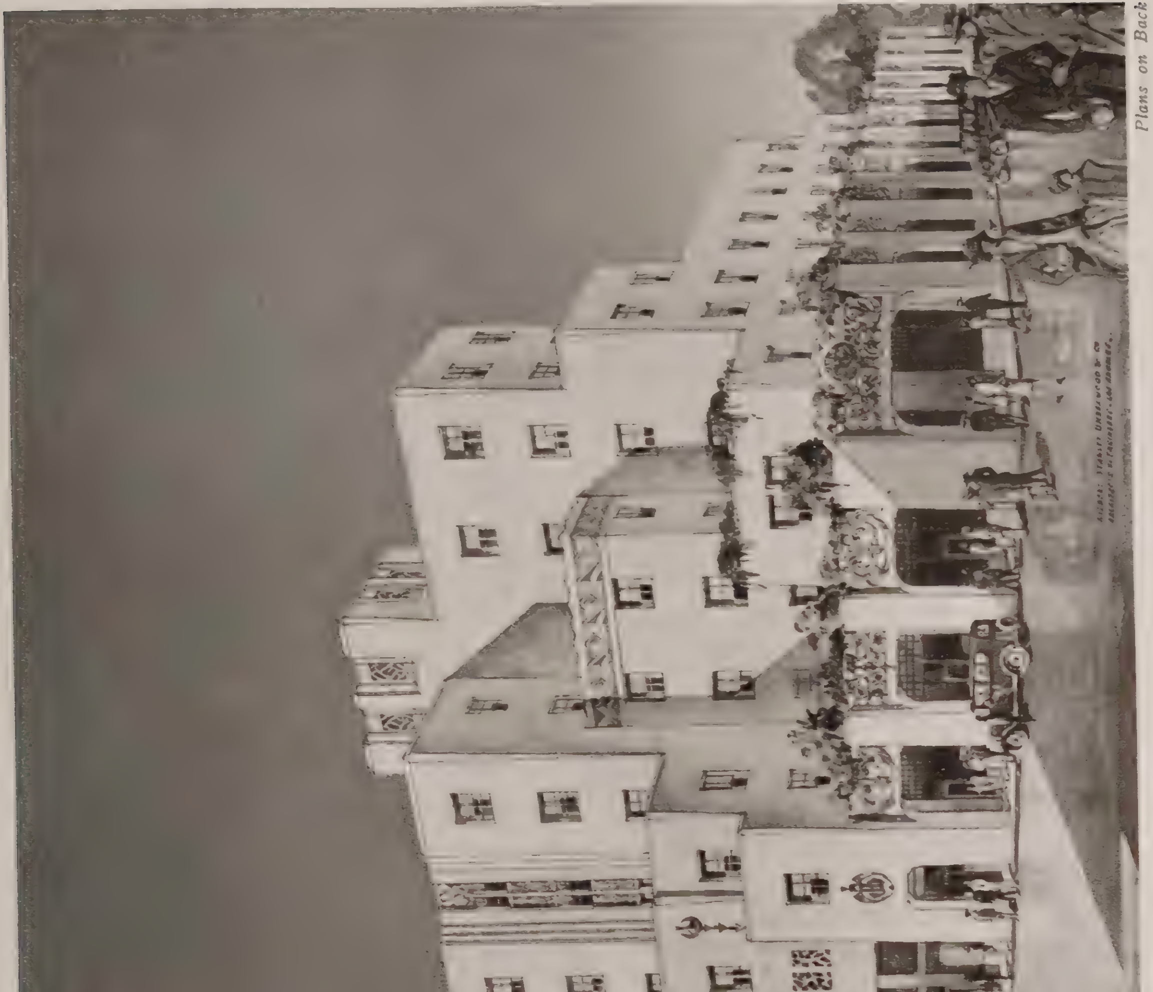
Number of guest rooms: 146.

Number of baths: 100.

Capacity of dining rooms: 350.

Capacity of ball room: 300.

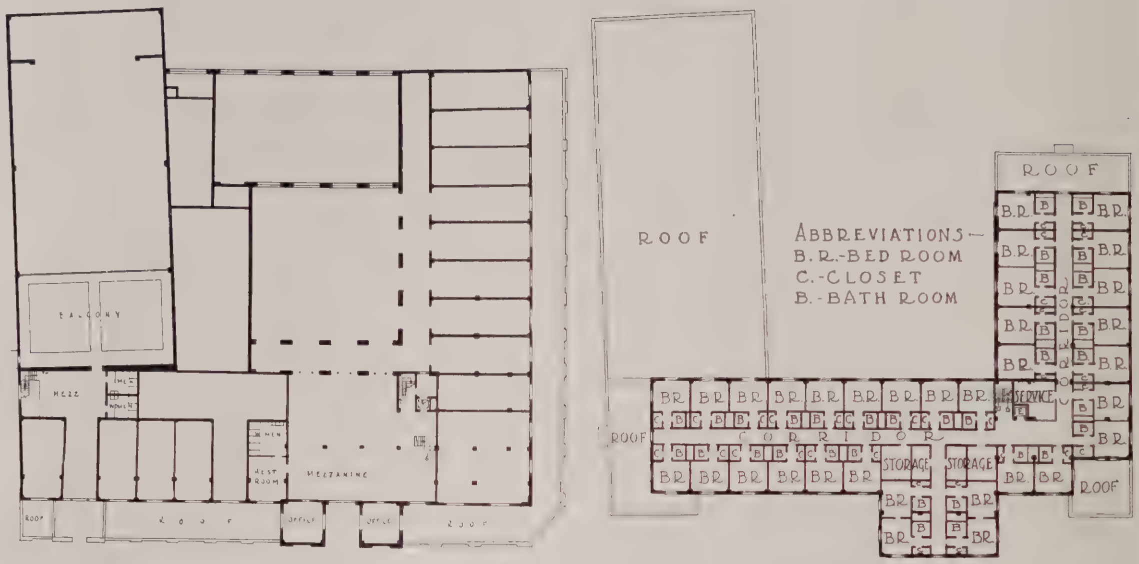
HOTEL HAWTHORNE, SALEM, MASS.
SMITH & WALKER AND H. L. STEVENS & CO., ASSOCIATED, ARCHITECTS



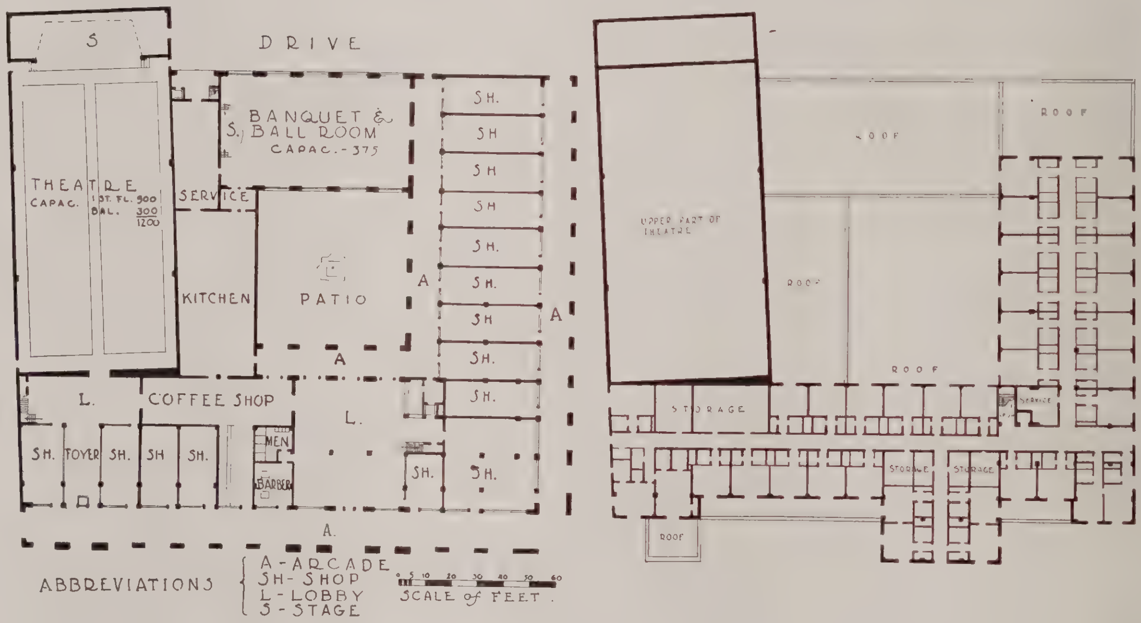
From the Architects' Rendering

Plans on Back

HOTEL APACHE, YUMA, ARIZ.
GILBERT STANLEY UNDERWOOD & CO., ARCHITECTS



MEZZANINE FLOOR THIRD FLOOR



FIRST FLOOR SECOND FLOOR

PLANS. HOTEL APACHE, YUMA, ARIZ.
GILBERT STANLEY UNDERWOOD & CO., ARCHITECTS

EFFICIENT PLANNING FOR ECONOMICAL OPERATION

BY

J. OTIS POST
OF GEORGE B. POST & SONS, ARCHITECTS

DURING the past decade hotel men have recognized as never before the necessity of practicing every economy in operation consistent with rendering good and efficient service to their guests. It is only recently they have realized that successful operation is largely dependent upon quick and efficient planning of the hotel to eliminate all waste motion in rendering the required service. This applies to the planning of the structural features of the building itself, as well as to the layout of the service portions of the house. It should always be borne in mind that each salary saved by efficient planning is an aid to economical operation. This is demonstrated by a few figures.

Let us assume that a hotel consultant (operator or architect), qualified by his past accomplishments to render expert advice, makes changes in preliminary plans that will reduce the payroll by only $200 per month, or $2400 per year. This amounts to 6 per cent interest on a capital investment of $40,000 that could not have been amortized or written off and would have been a handicap to the operation of the hotel during its life, unless corrected subsequently by the expenditure of additional capital. The assumption is that the structural layout for the building is economical, and the layouts of the dining rooms, convention hall and its accessories, committee rooms convertible into private dining rooms, etc., as well as the grill room, are grouped about the main kitchen with serving pantries in as direct contact to it as is permitted by the most efficient development of the property.

It is obvious that an architect, who by long practice and experience in hotel design is familiar with the many intricate requirements of hotels, can effect many savings in the building cost of a hotel, which may seem trifling if made in a private residence, but which, when multiplied several hundred times, according to the number of rooms in a hotel, amounts to savings running into thousands of dollars.

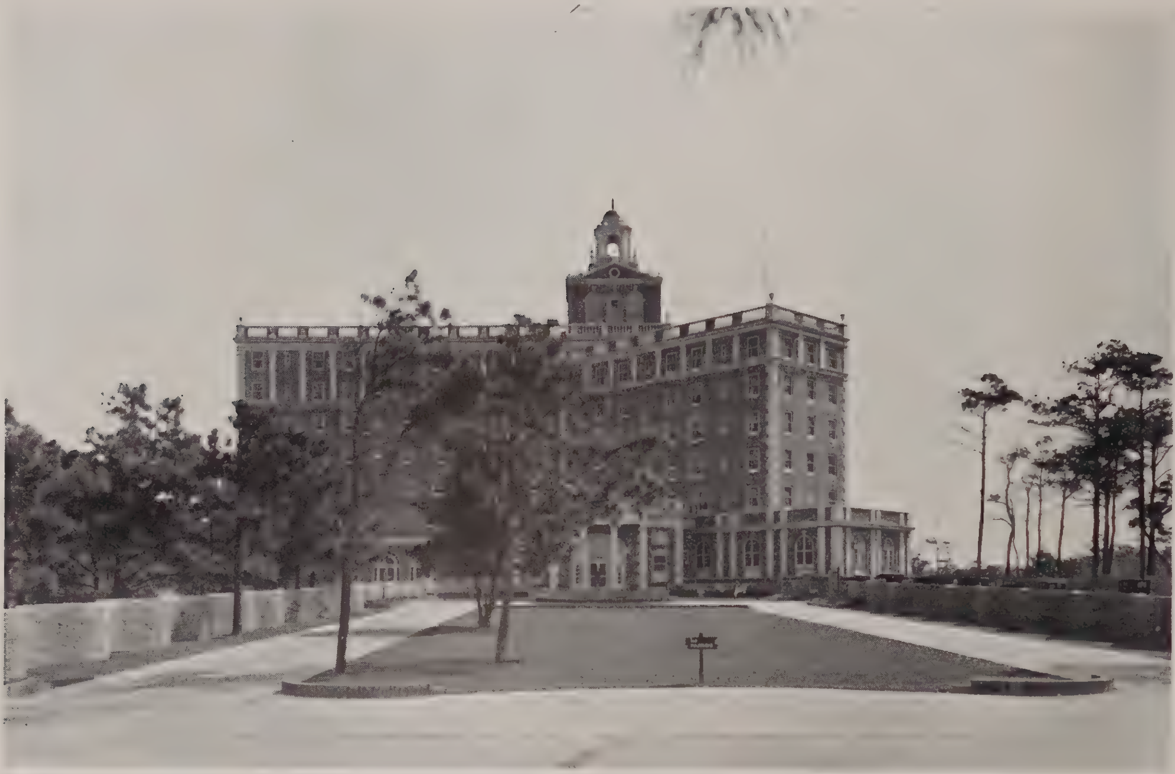
Hotel men and bankers commend the architects who produce artistic effects which appeal to the public by clever architectural treatment of simple building materials and artistic use of color rather than by resorting to the use of expensive and choice imported marbles and elaborately carved woodwork. In the selection of the materials, the life and upkeep of the hotel are of primary importance. In the construction cost an additional expenditure of $40,000 (to use the same figure) may be justified from the maintenance or from the artistic point of view. This capital investment in the initial cost of the building can and will be amortized and written off, and it is only a temporary handicap to the most economical operation of the house, whereas a plan that requires more help than should be necessary is inefficient and always a serious handicap to the hotel management.

The incorporation of shops in hotels in New York has become an essential since the building of the Roosevelt. In the case of the Roosevelt Hotel it was demonstrated that by making a plan whereby the maximum shop rentals were obtainable, this hotel could be erected on Madison Avenue, 45th and 46th Streets, running through to Vanderbilt Avenue, in spite of the high ground rental. In reality, the income derived from the shops exceeded the estimated rental, which was sufficient to make the hotel on this site a good business venture. Since then shops have replaced the dining rooms on Madison Avenue in the Biltmore, and before that on Broadway in the Astor, as well as in many other hotels where rental values of stores have justified extensive and costly alterations.

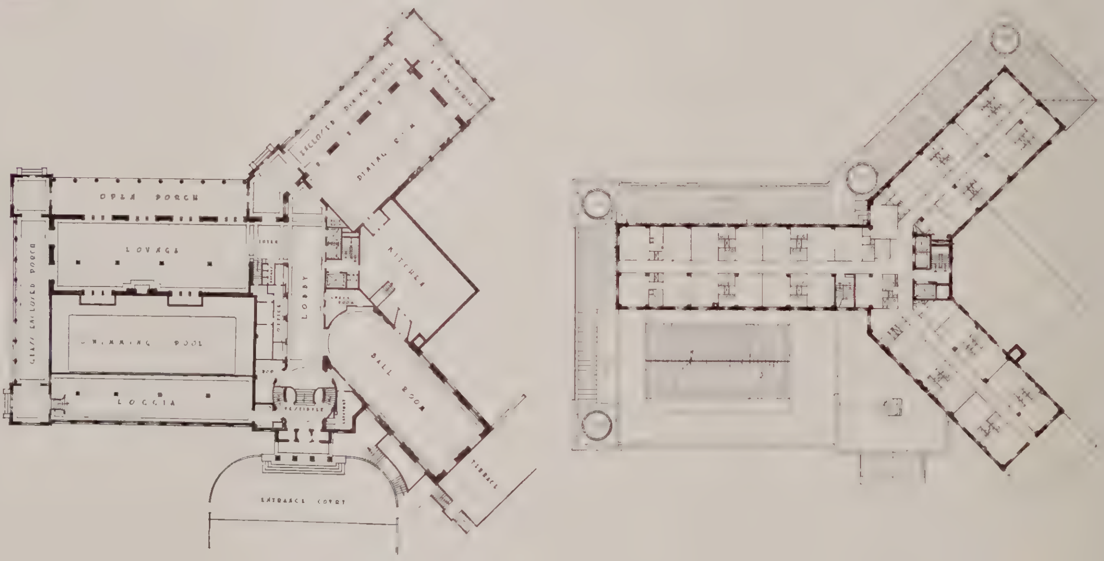
As in the case of the Roosevelt, by a careful study of the approach to the lobby by interrupted runs of stairs, guests will walk up to 25 steps before reaching the dining rooms, without realizing that they have done so and without considering it a hardship. Of course, elevator service from the ground floor should be provided for invalids, and for those objecting to the stairs, but the latter are few in number. The public has accepted the elevated lobby without comment.

There is no need at this time to further explain the "Statler Idea," which was the subject of a series of articles contributed to THE ARCHITECTURAL FORUM by my firm (published in November and December, 1917, and in January and February, 1928), and supplemented by articles entitled "The Hotel Plan," and "Modern Hotel Construction" with "Engineering Details" appearing in the Hotel Reference Number of November, 1923. In these articles we pointed out the difference between the older hotels and the new type of high class transient hotel being developed, illustrated by the Hotels Statler in Cleveland, Detroit and St. Louis.

Prior to 1910 the requirements for a hotel were almost as individual as those of a private residence. The designs were made often for laymen owners of property who wished to build hotels thereon; when built, managers were employed to operate them. Some operated profitably, and many were unable to do so. Even hotel men,



GENERAL VIEW

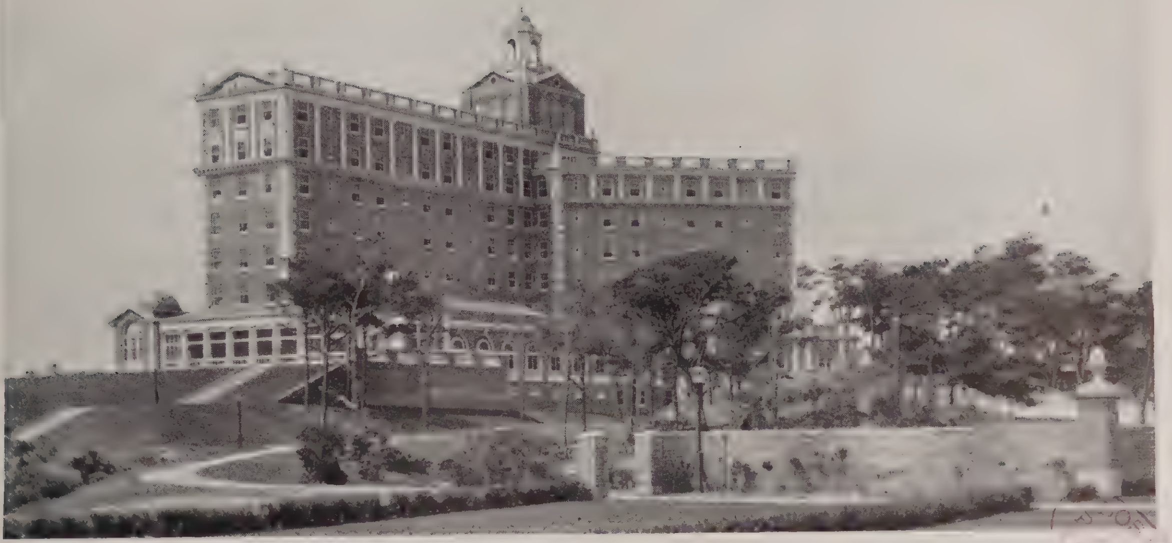


GROUND FLOOR

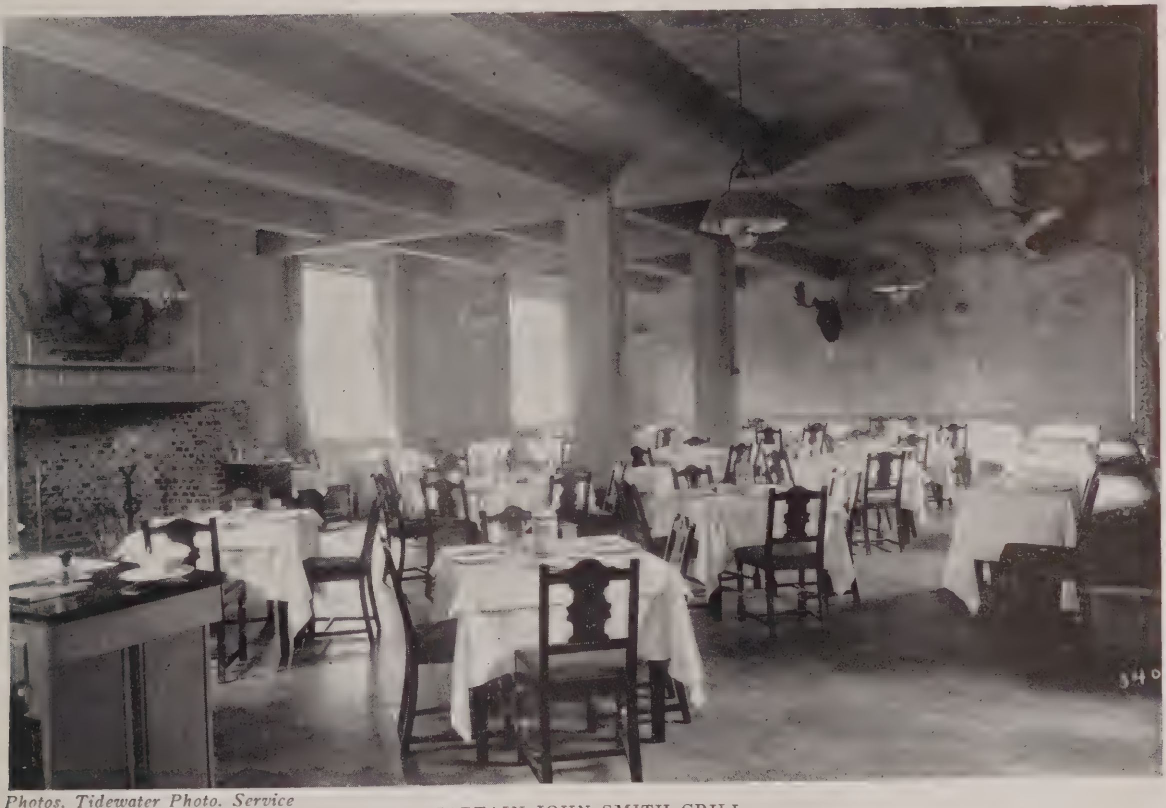
SECOND FLOOR

CAVALIER HOTEL, VIRGINIA BEACH, VA.

NEFF & THOMPSON, ARCHITECTS
GEORGE B. POST & SONS, CONSULTANTS



REAR ELEVATION



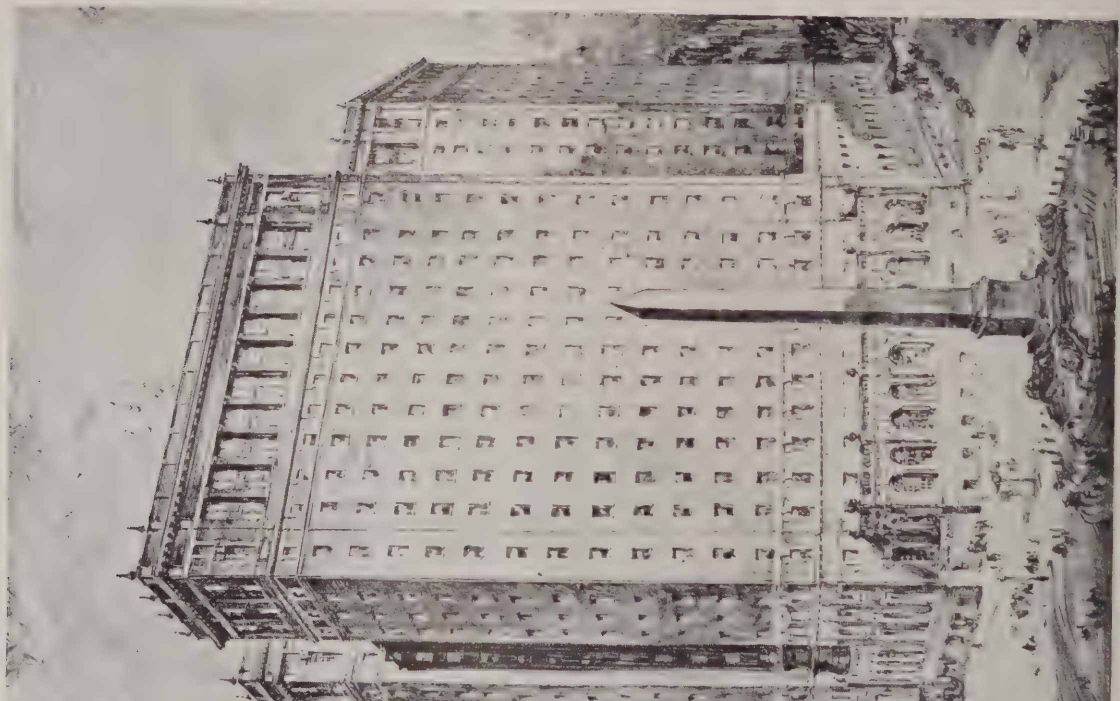
Photos. Tidewater Photo. Service

CAPTAIN JOHN SMITH GRILL

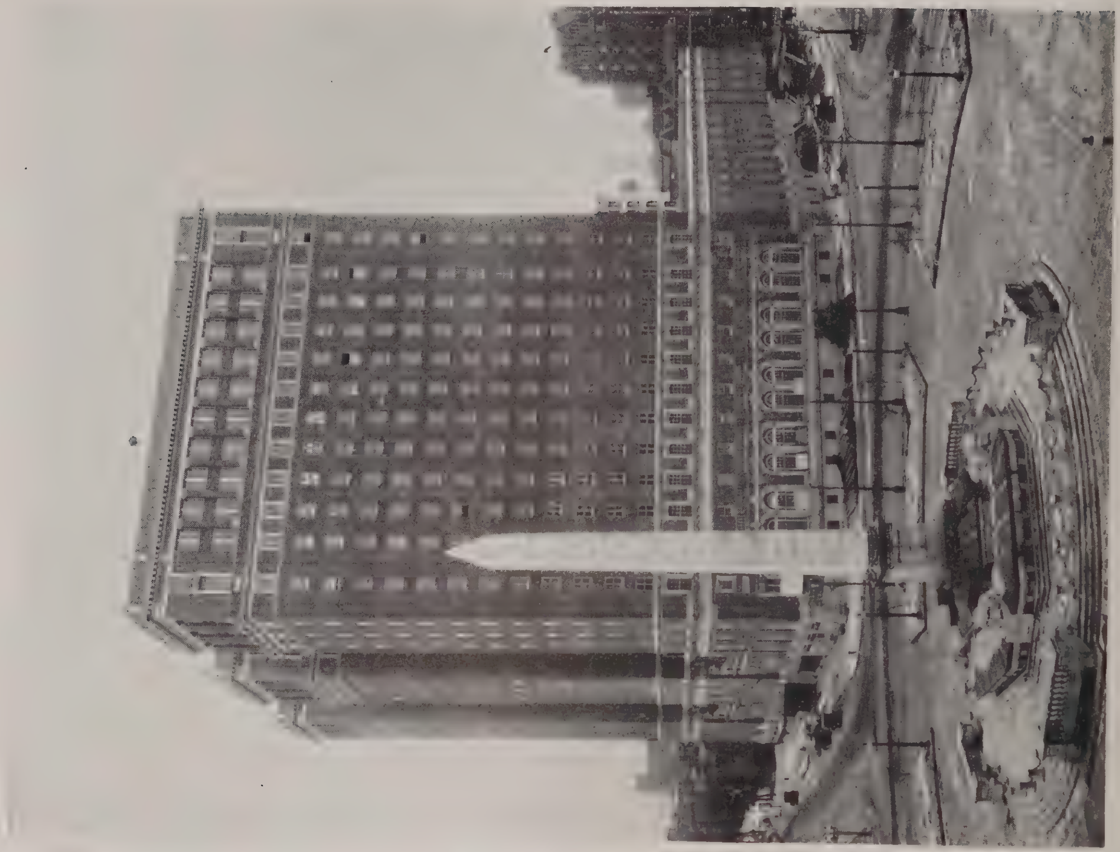
CAVALIER HOTEL, VIRGINIA BEACH, VA.

NEFF & THOMPSON, ARCHITECTS

GEORGE B. POST & SONS, CONSULTANTS



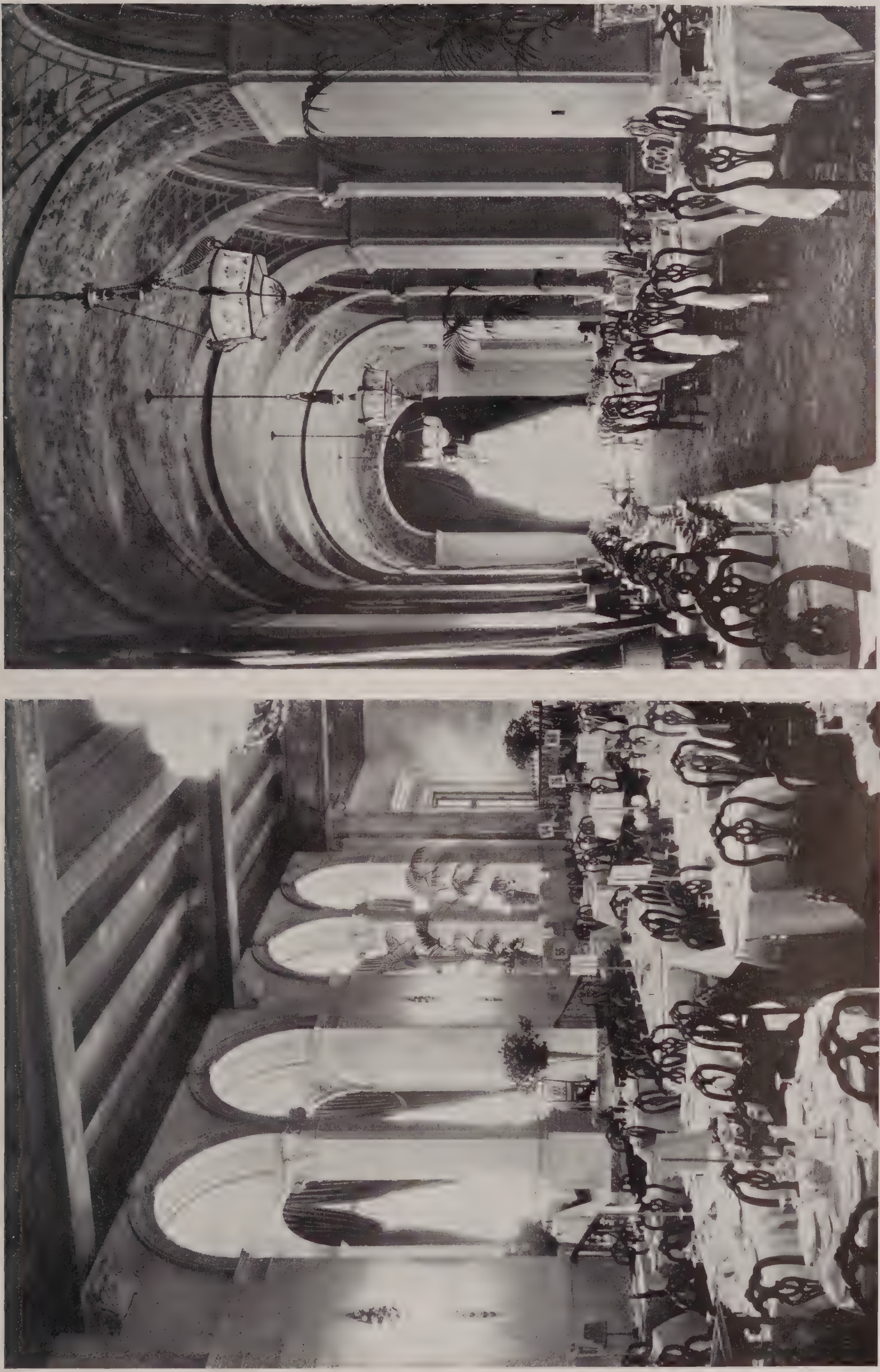
PERSPECTIVE SKETCH BY C. A. HARST



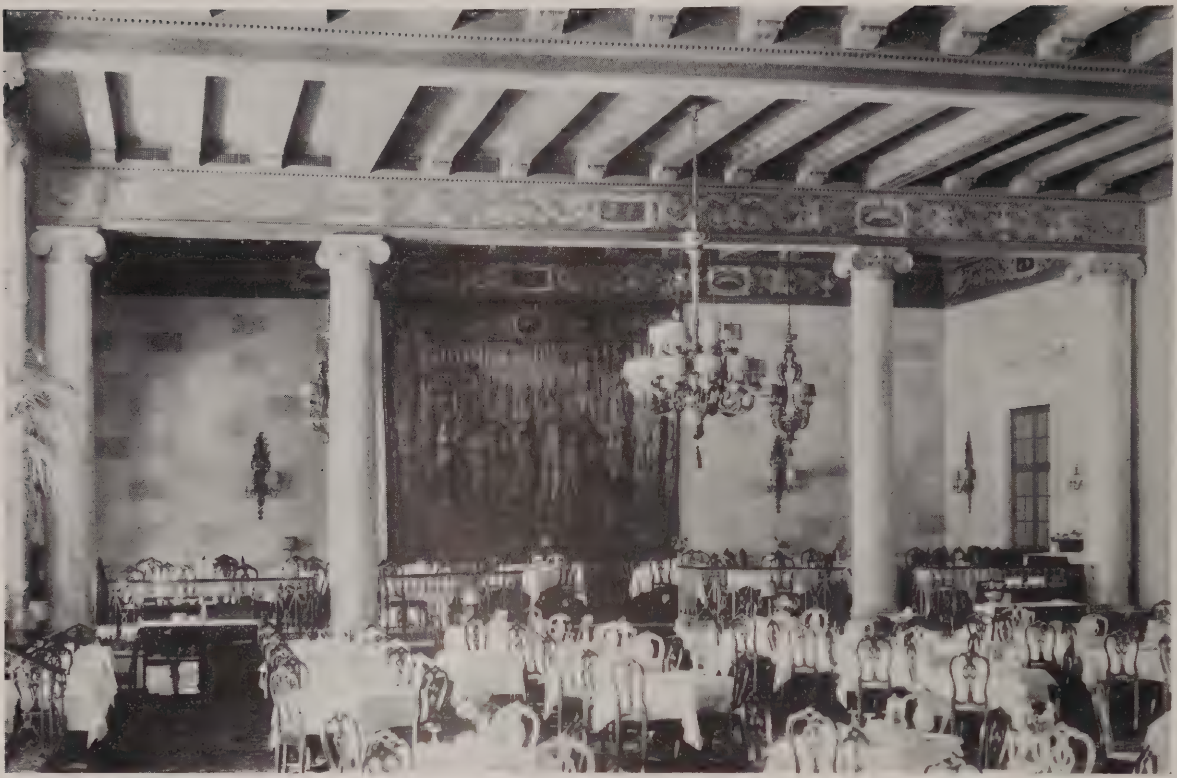
VIEW OF COMPLETED BUILDING

HOTEL STATLER, BUFFALO
GEORGE B. POST & SONS, ARCHITECTS

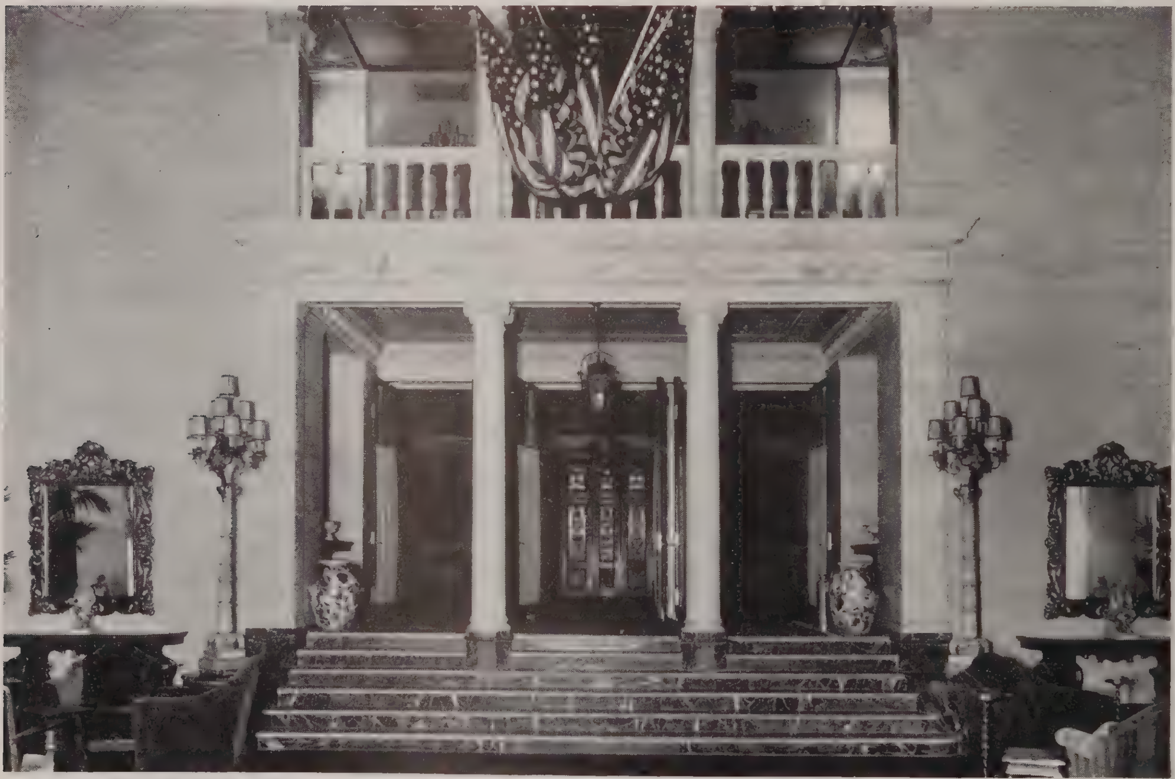
Photos. Hare



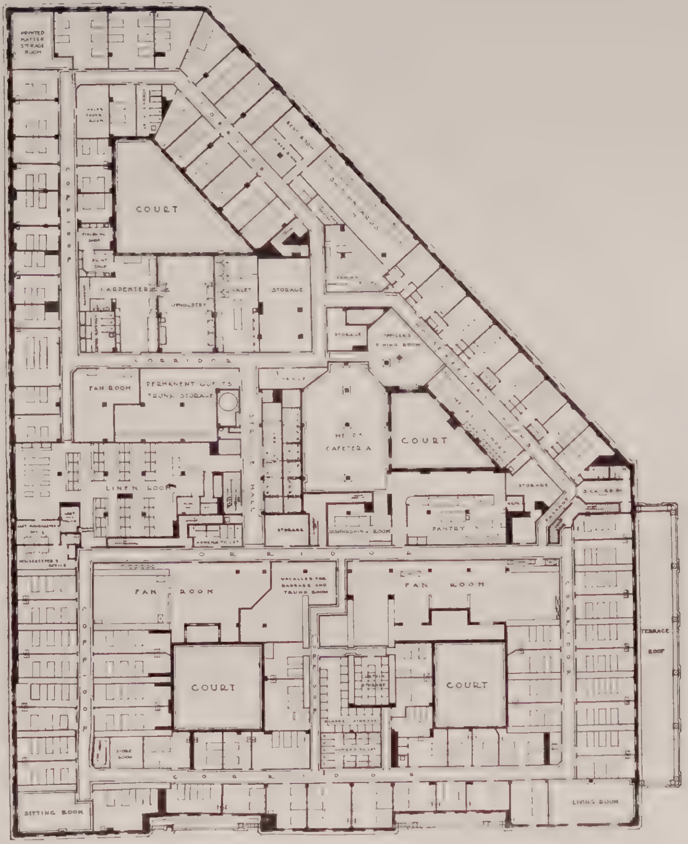
TWO VIEWS OF THE MAIN DINING ROOM
HOTEL STATLER, BUFFALO
GEORGE B. POST & SONS, ARCHITECTS



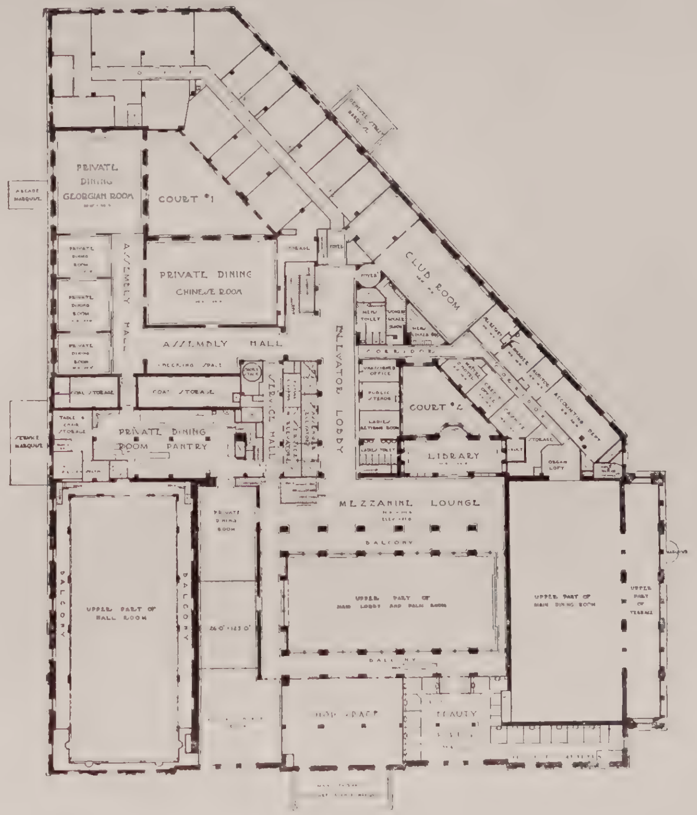
END OF MAIN DINING ROOM



ENTRANCE TO BALL ROOM FOYER
HOTEL STATLER, BUFFALO
GEORGE B. POST & SONS, ARCHITECTS

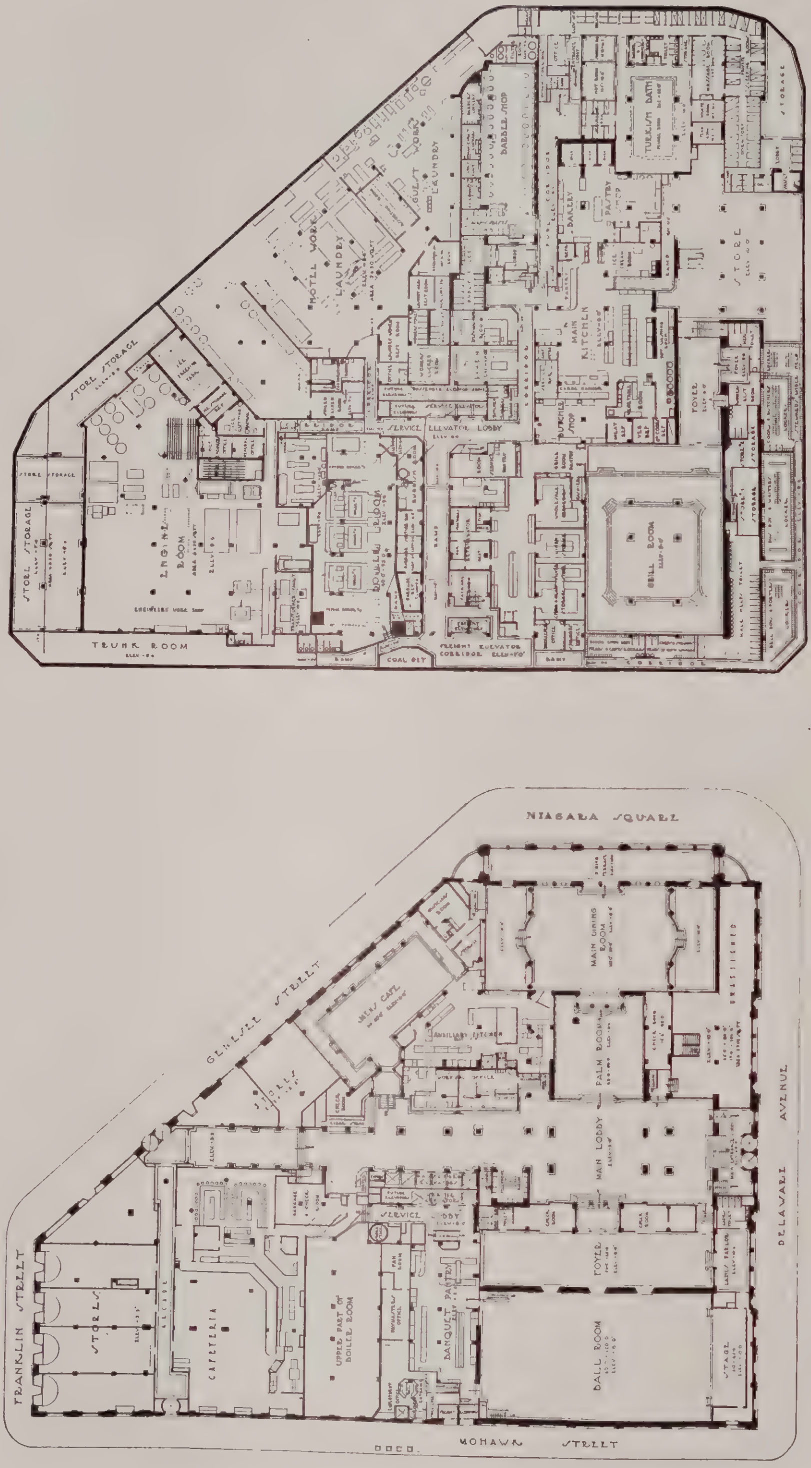


SECOND OR SERVICE FLOOR



MEZZANINE FLOOR

PLANS. HOTEL STATLER, BUFFALO
GEORGE B. POST & SONS, ARCHITECTS



GROUND FLOOR

MAIN FLOOR

PLANS. HOTEL STATLER, BUFFALO
GEORGE B. POST & SONS, ARCHITECTS

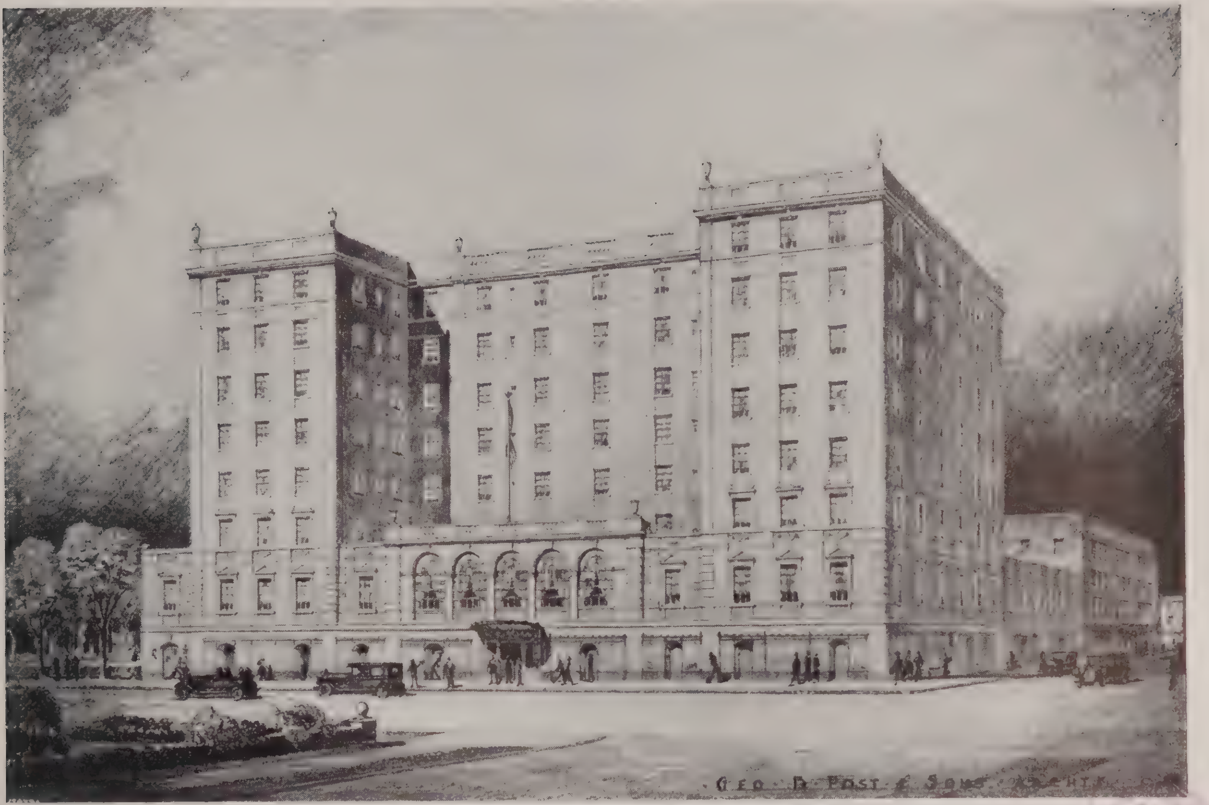

GEO. B. POST & SONS ARCHTS

Photo. Wurts Bros.

PERSPECTIVE SKETCH OF PROPOSED DESIGN

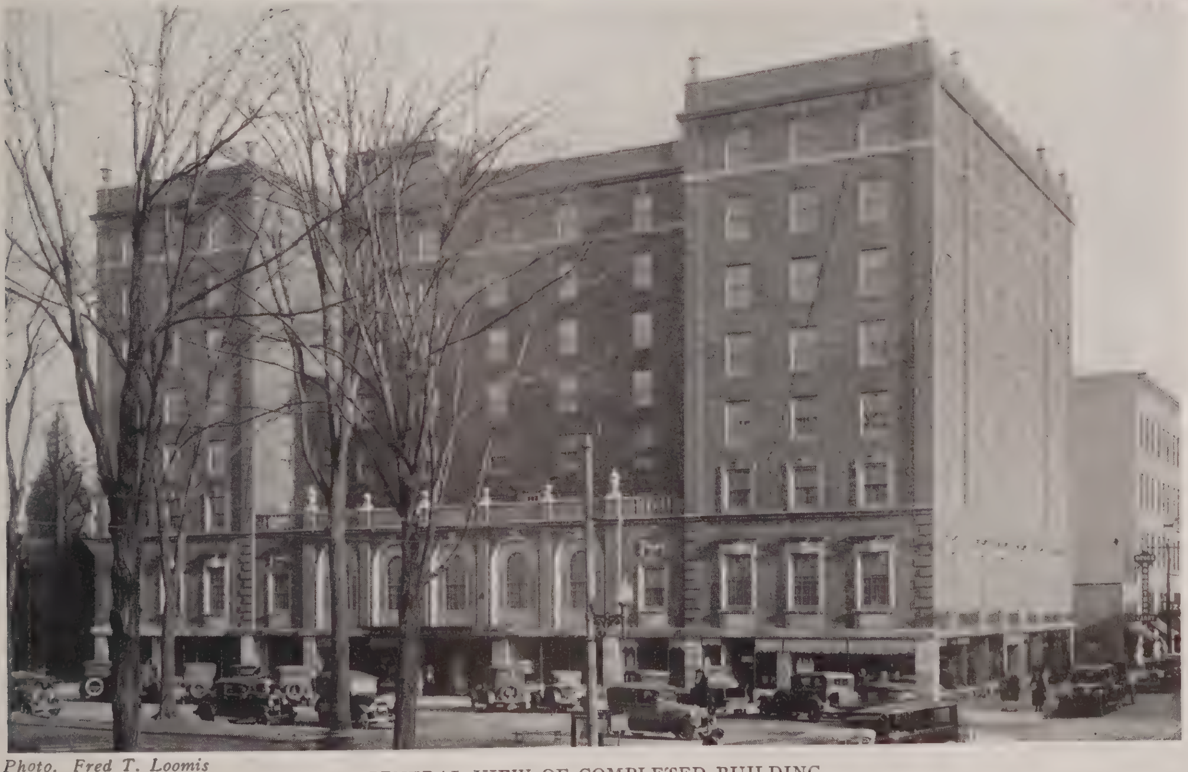
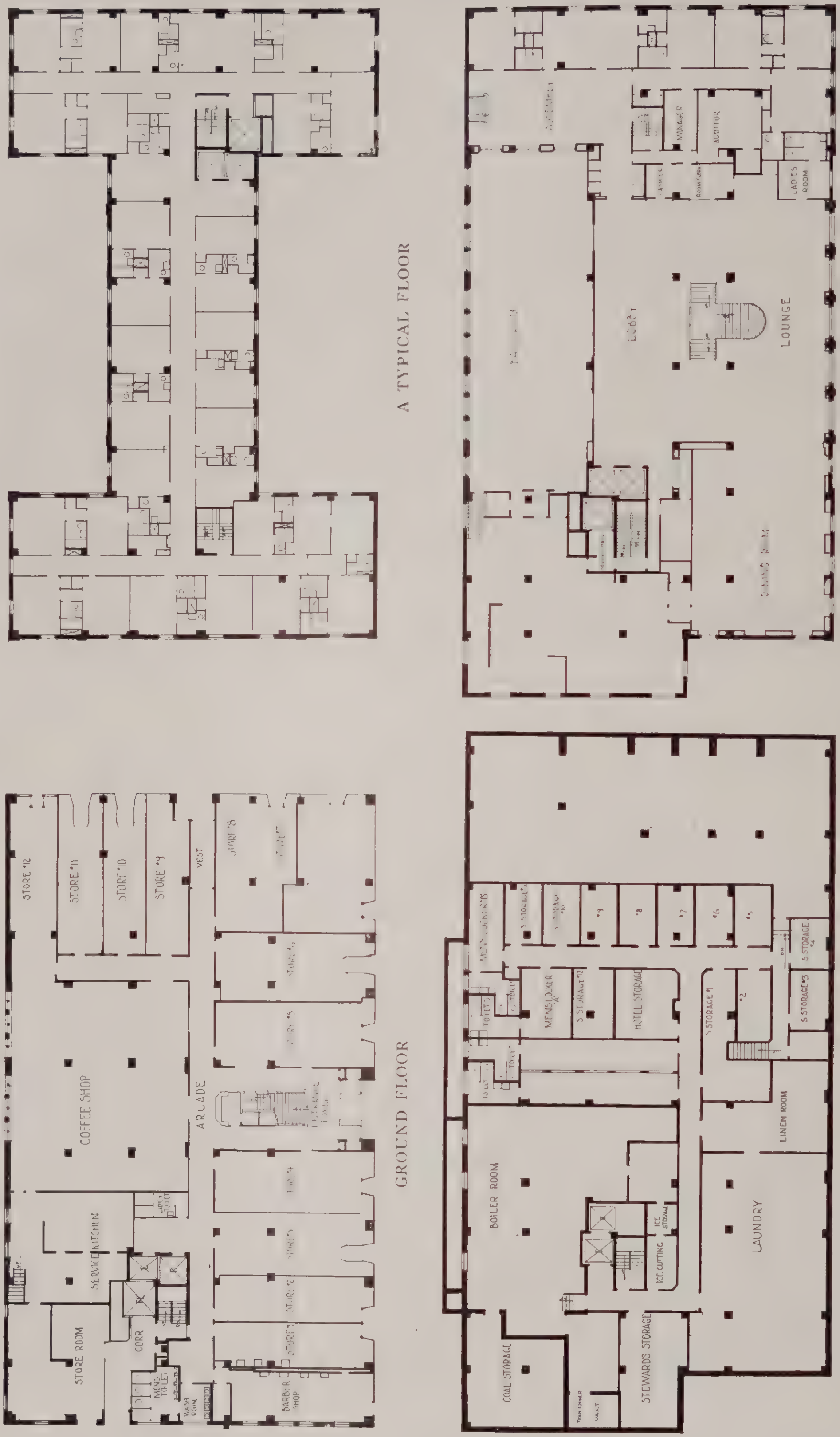


Photo. Fred T. Loomis

GENERAL VIEW OF COMPLETED BUILDING
MARK TWAIN HOTEL, ELMIRA
GEORGE B. POST & SONS, ARCHITECTS
L. E. CONSIDINE, ASSOCIATED



PLANS, MARK TWAIN HOTEL, ELMIRA
GEORGE B. POST & SONS, ARCHITECTS
L. E. CONSIDINE, ASSOCIATED

Photo. Wurts Bros.

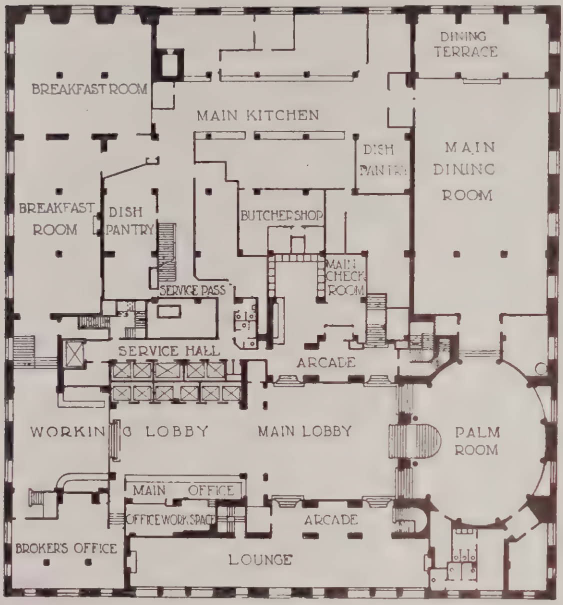
HOTEL ROOSEVELT, NEW YORK
GEORGE B. POST & SONS, ARCHITECTS

when building to operate, were lavish in the sizes of rooms, extravagant in the use of costly materials, often handicapped by too few bathrooms, and inconvenienced by poor planning. Then the hotel requirements, as well as their operation by large hotel companies, became standardized, and as a logical result the financial world recognized the hotel and its operation as an organized industry. No longer do bankers consider the financing of a hotel a dangerous experiment, nor are the personality of the operator, his individual knowledge, personal experience and integrity the governing considerations in making a loan. While all these factors enter into the equation, there are now many other tangible factors which they can estimate, governing it, the law of supply and demand, the costs of operation and established earnings under normal conditions, etc. In short, hotel operation became a recognized business. Instruction in hotel management is now a part of the curriculum of business schools in some of our universities.

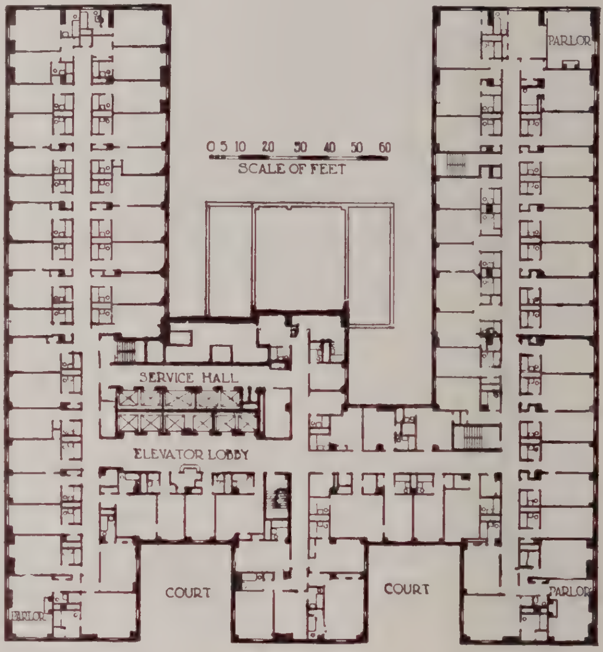
Since the publication of "The Statler Idea" 12 years ago, the so-called Statler bathroom with its running ice water, and the many other innovations of that time, have become as it were standard features in hotel planning of today, and create little or no comment. Mr. Statler's slogan of "Efficiency in Planning for Economy in Operation" is still full of significance, and is further illustrated in the subsequent links in the Statler chain built in Buffalo and Boston. In each building greater refinements in the use of building materials were practiced to keep down the constantly increasing cost of building construction.

It is but fitting that I should at this time pay tribute to the great master builder of hotels with whom we had the good fortune to have coöperated for 18 years in the study of the modern hotel's problems, and in all that might add to the comfort and convenience of his guests, as well as in the standardization of that which might lead to greater efficiency in hotel operation. He mastered the many technical details in connection with the actual building needs. He understood heating, lighting and ventilation as few laymen did; and whereas he, at first, demanded a "classy" architectural design, in later years he could discuss the æsthetics of architectural composition and decoration with true insight and understanding. By E. M. Statler's untimely death, the world lost a leader in progressive thought and action,—a great hotel man and a great business man, one active in mind and body, of keenest insight and comprehension of the coöperation of his associates, coupled with an infallible memory and a sense of honor that was never questioned. His host of friends and admirers will carry on the development of the so-called "Statler Idea," so closely identified with the American hotels of today, already introduced abroad in the construction of modern hotels of Europe and Great Britain.

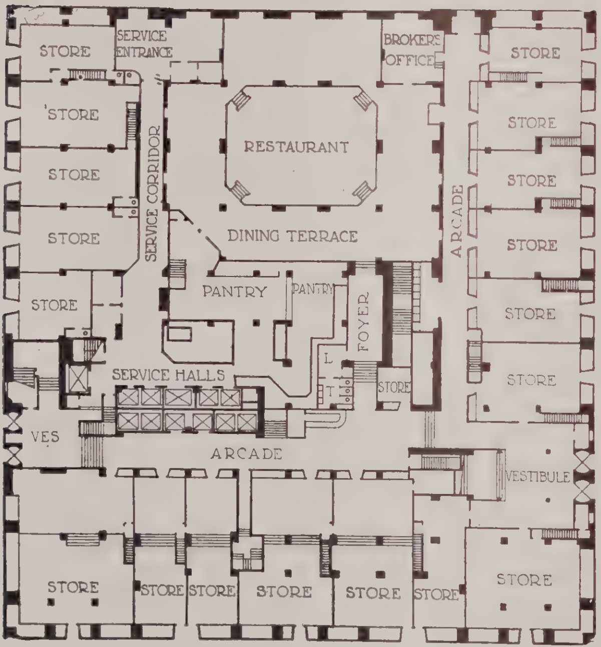
Editor's Note. For the past 25 years no firm of architects in this country has contributed more to the development of hotel architecture than the firm of George B. Post & Sons. It is our pleasure and privilege to present in these pages illustrations and plans of several of their recently completed hotels. In this interesting group the Hotel Roosevelt has been included, although plans and a rendered drawing of it were shown in our first Hotel Reference Number published in November, 1923, since which date the hotel has been completed and opened.



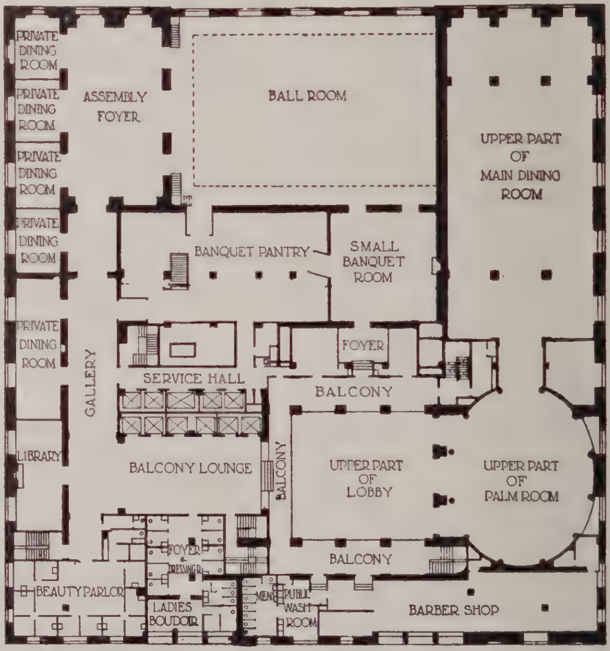
Main Floor



A Typical Floor

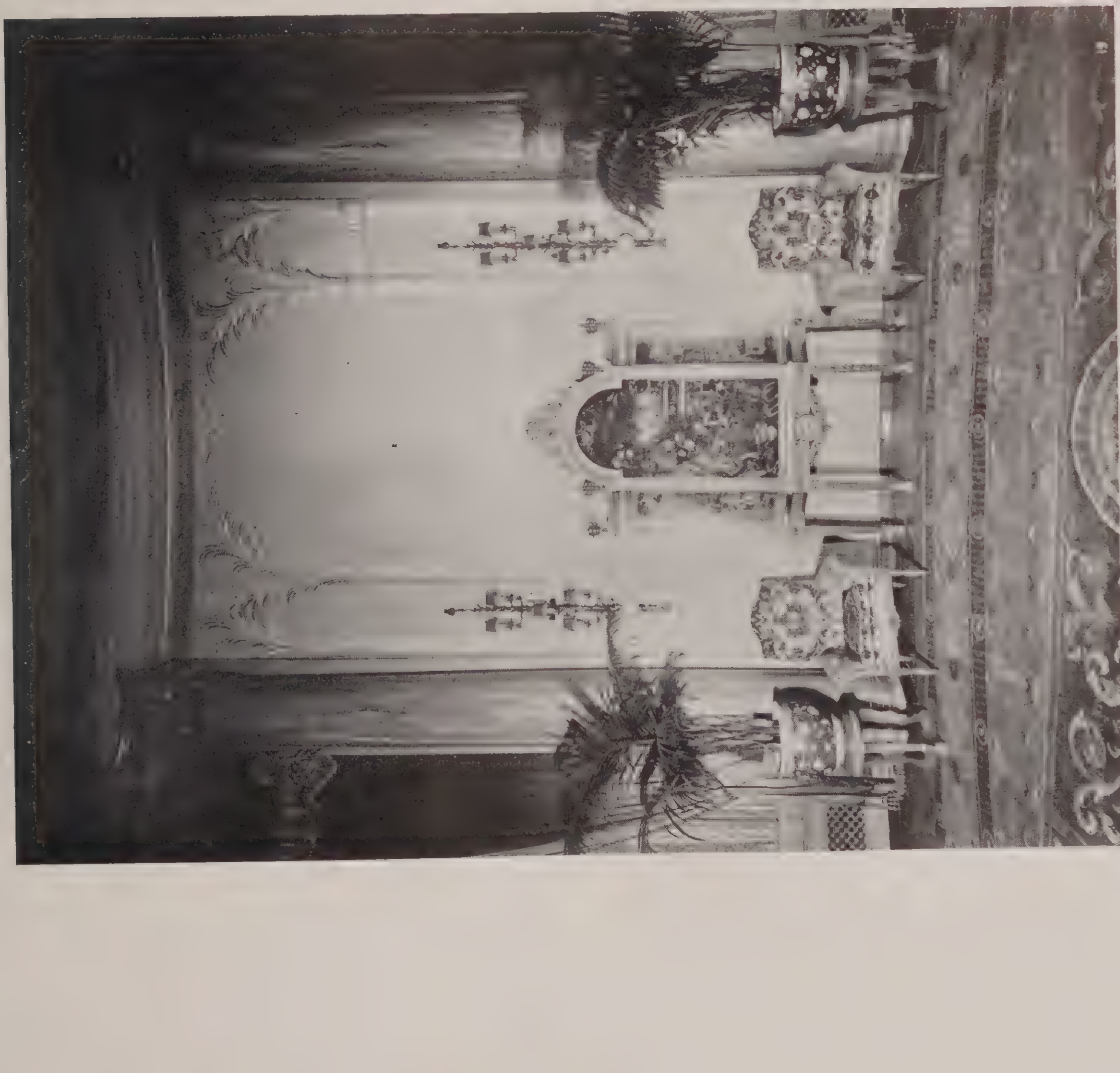


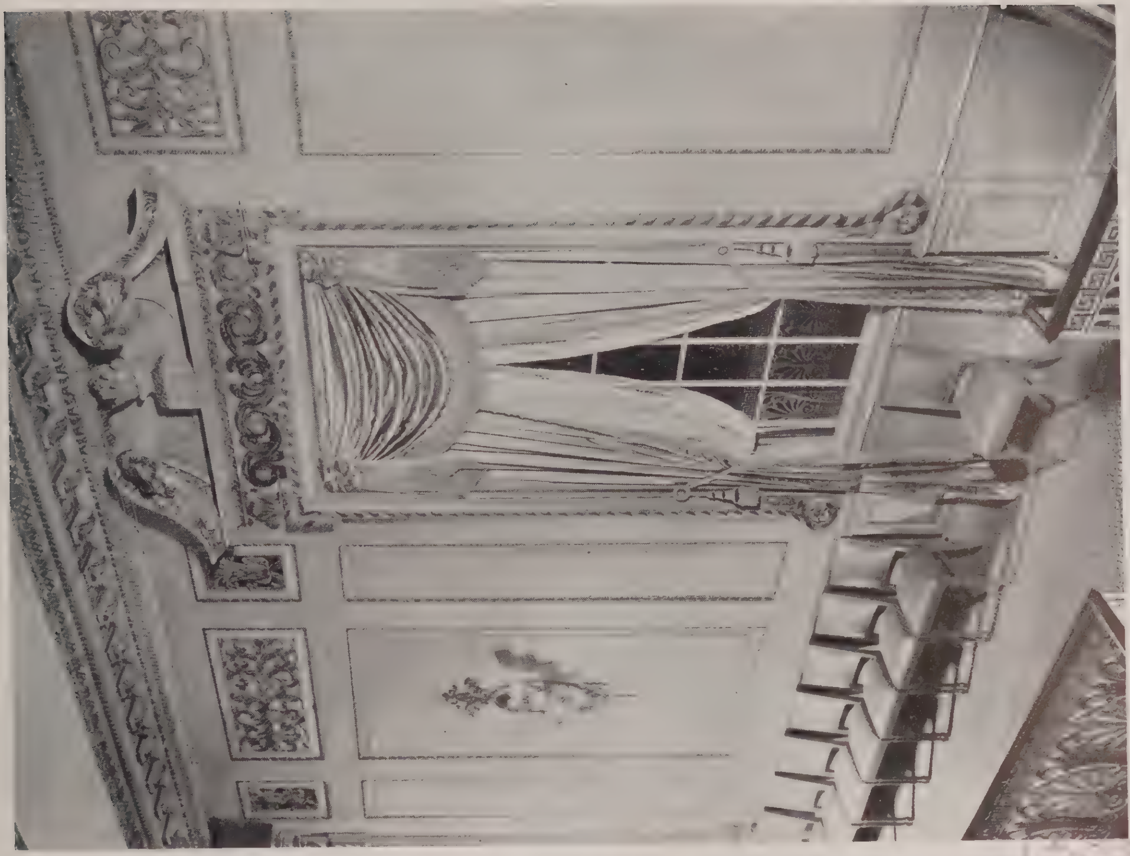
Ground Floor



Mezzanine Floor

Plans. Hotel Roosevelt, New York
George B. Post & Sons, Architects



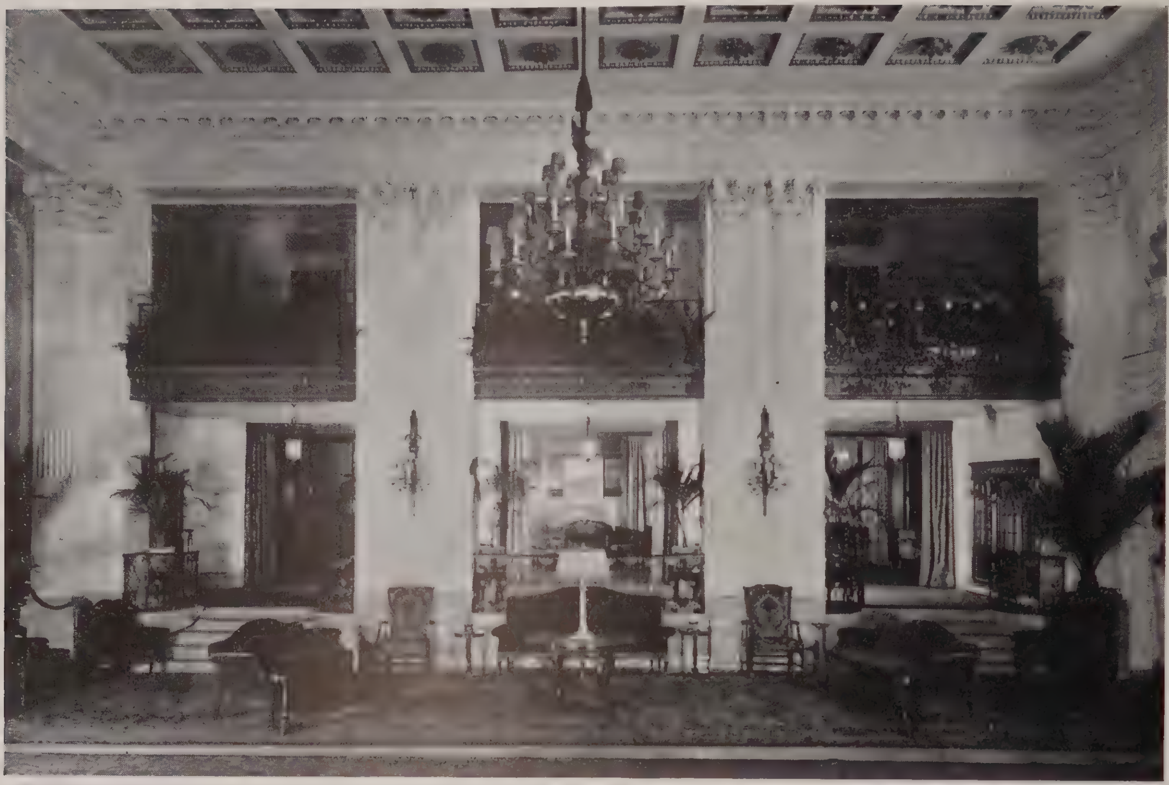


Photos. Lewis F. Nathan Co.

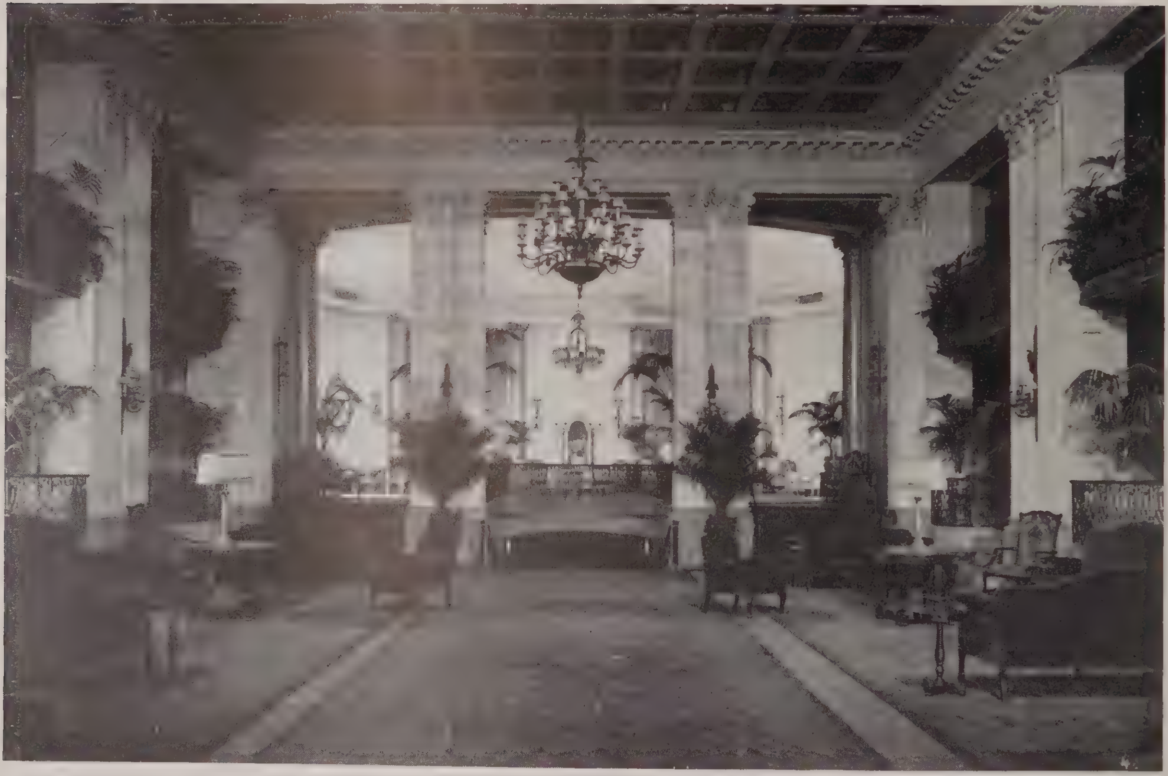
DETAIL OF PALM ROOM

HOTEL ROOSEVELT, NEW YORK
GEORGE B. POST & SONS. ARCHITECTS

DETAIL OF BALL ROOM BALCONY



WEST SIDE OF LOBBY



SOUTH SIDE OF LOBBY

HOTEL ROOSEVELT, NEW YORK

GEORGE B. POST & SONS, ARCHITECTS

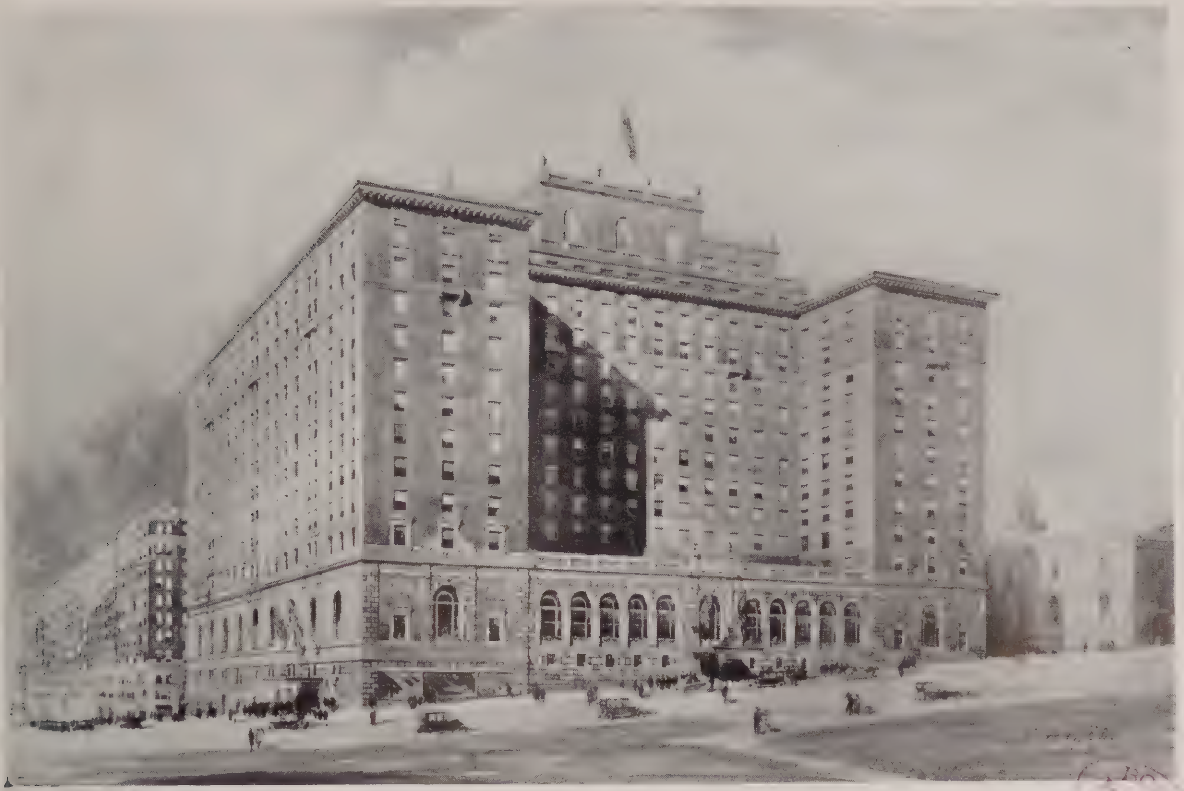
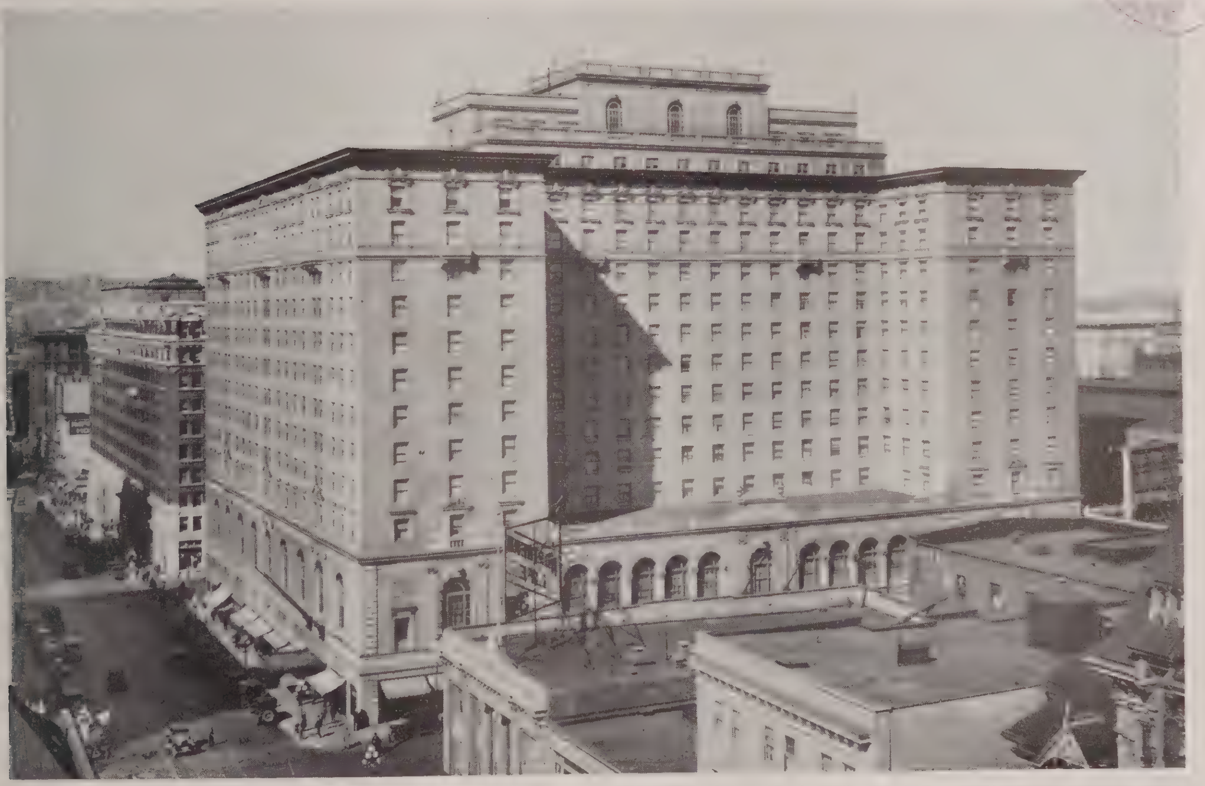


Photo. Wurts Bros.

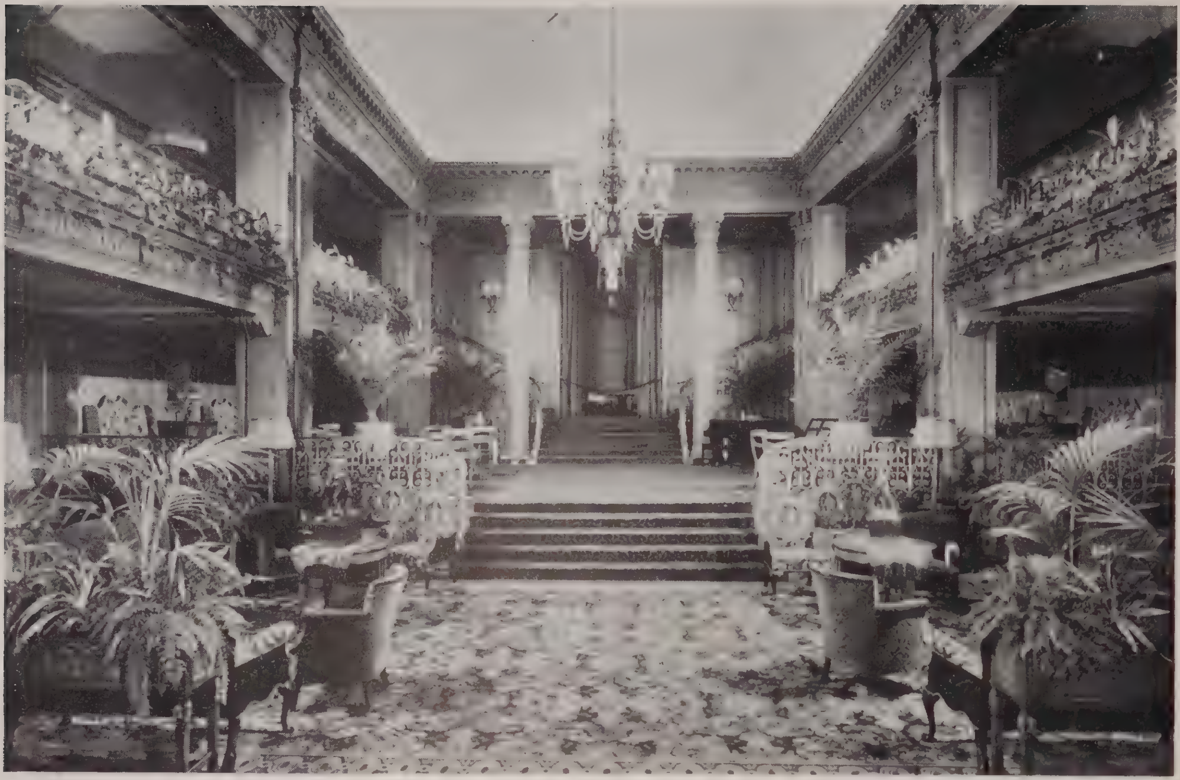
ARCHITECTS' PERSPECTIVE SKETCH



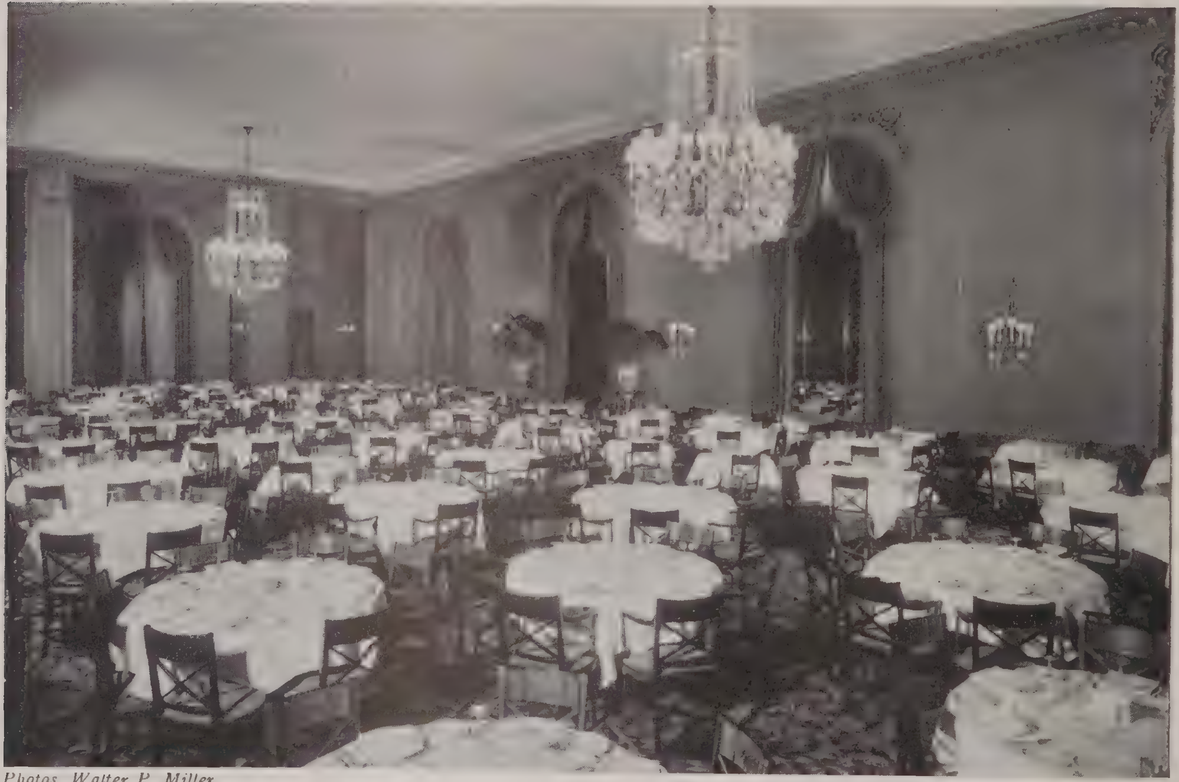
VIEW OF COMPLETED BUILDING

OLYMPIC HOTEL, SEATTLE

GEORGE B. POST & SONS, ARCHITECTS



PALM ROOM

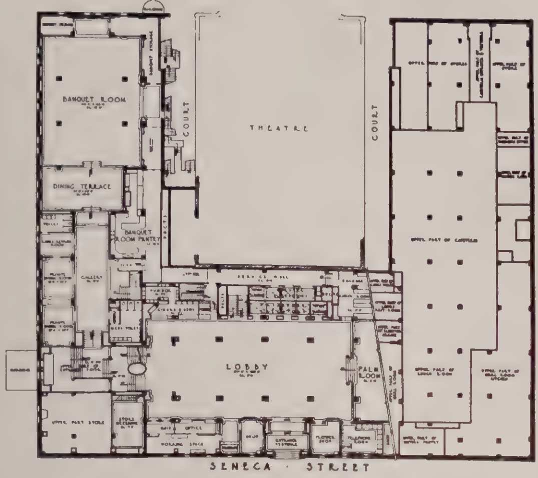


Photos. Walter P. Miller

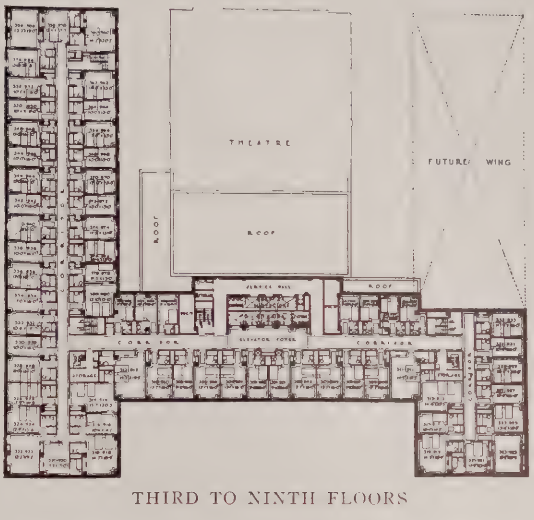
GEORGIAN DINING ROOM

OLYMPIC HOTEL, SEATTLE

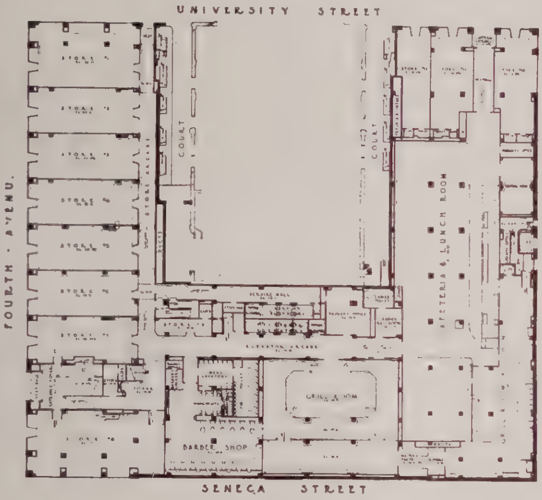
GEORGE B. POST & SONS, ARCHITECTS



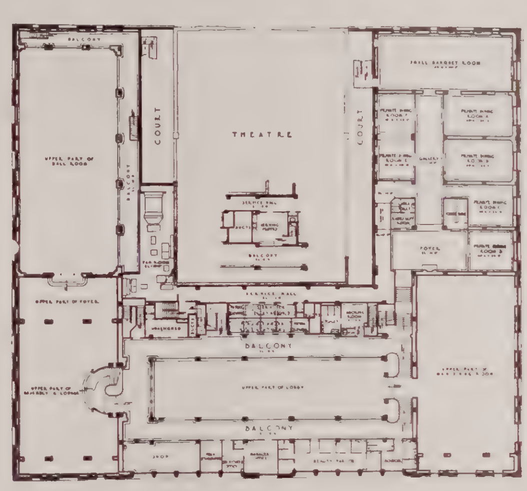
GROUND-MEZZANINE FLOOR



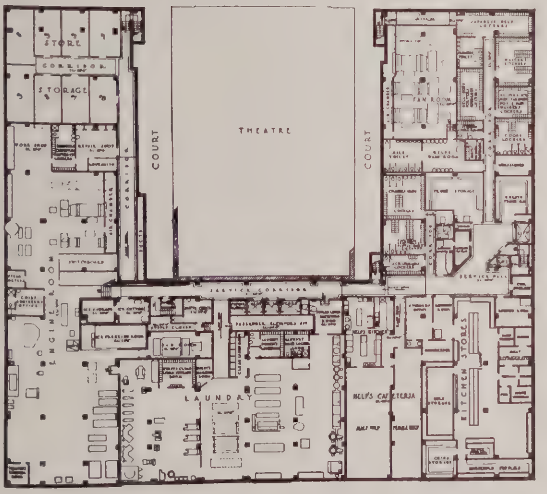
THIRD TO NINTH FLOORS



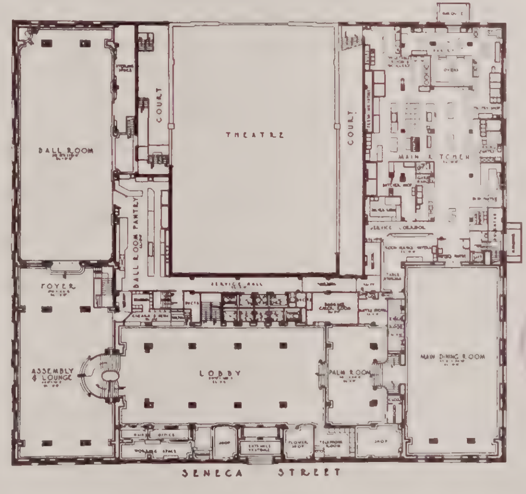
GROUND FLOOR



MEZZANINE FLOOR

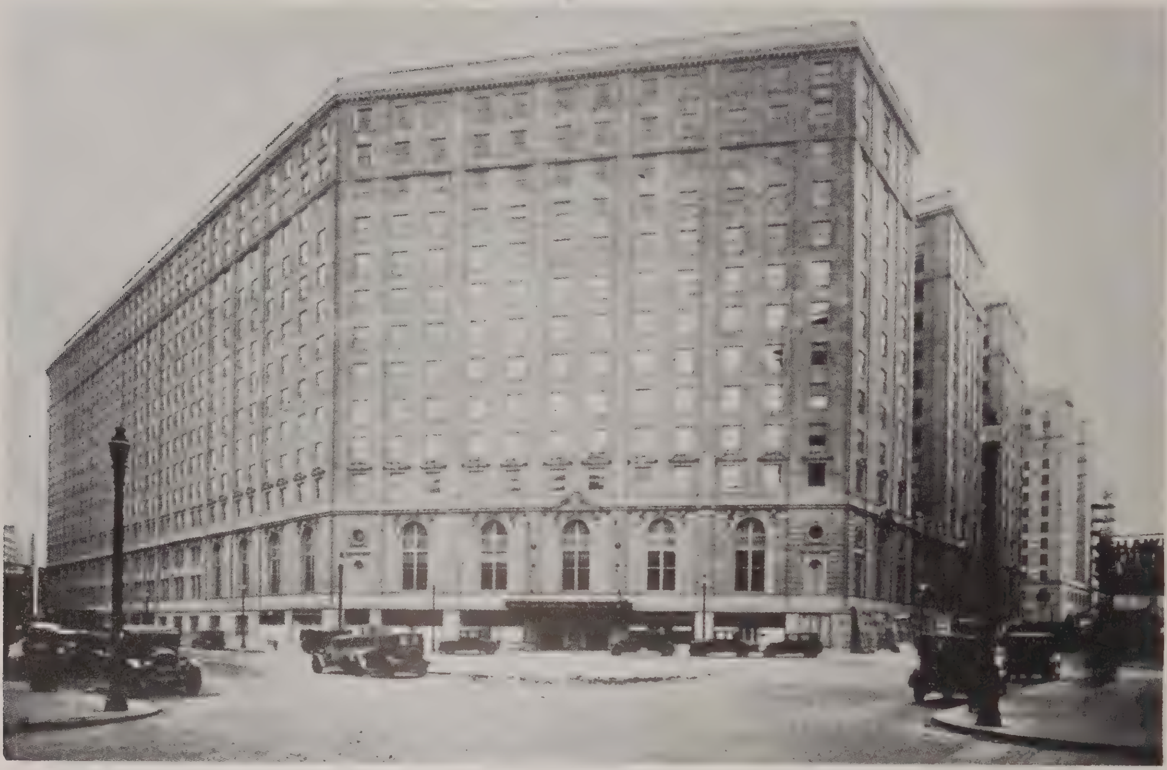


BASEMENT FLOOR



FIRST FLOOR

PLANS, OLYMPIC HOTEL, SEATTLE
GEORGE B. POST & SONS, ARCHITECTS



VIEW OF THE COMPLETED BUILDING

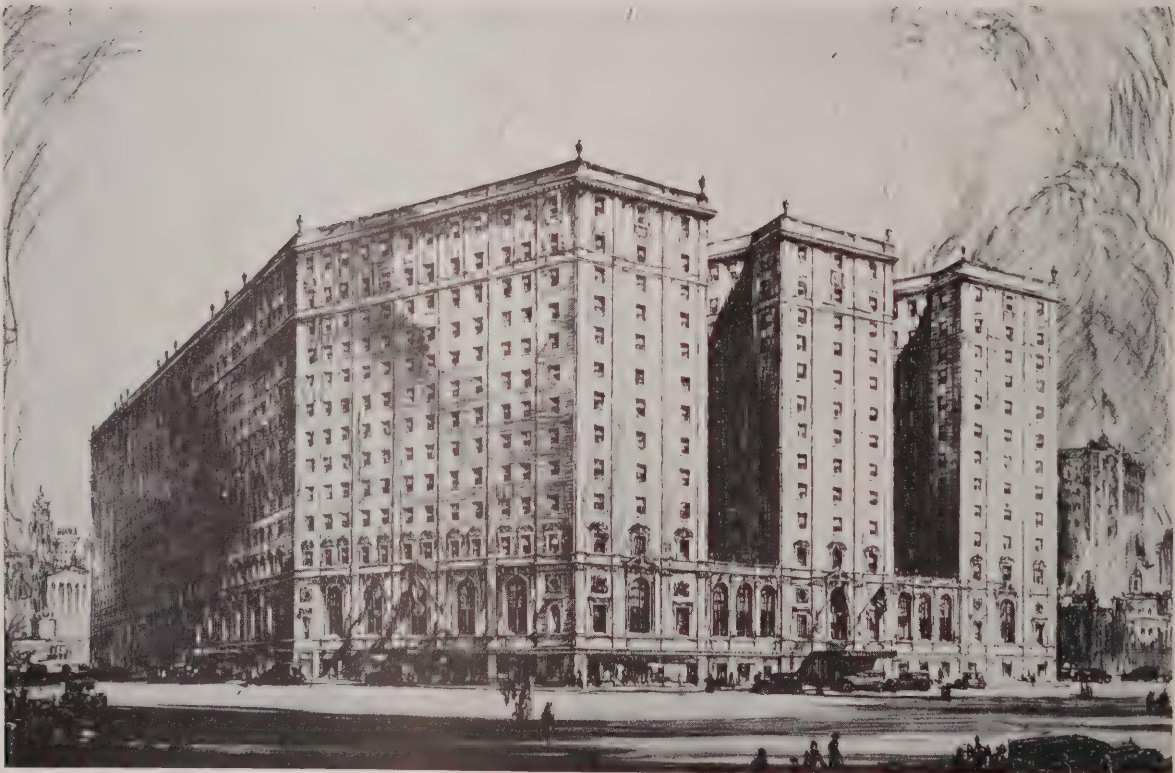
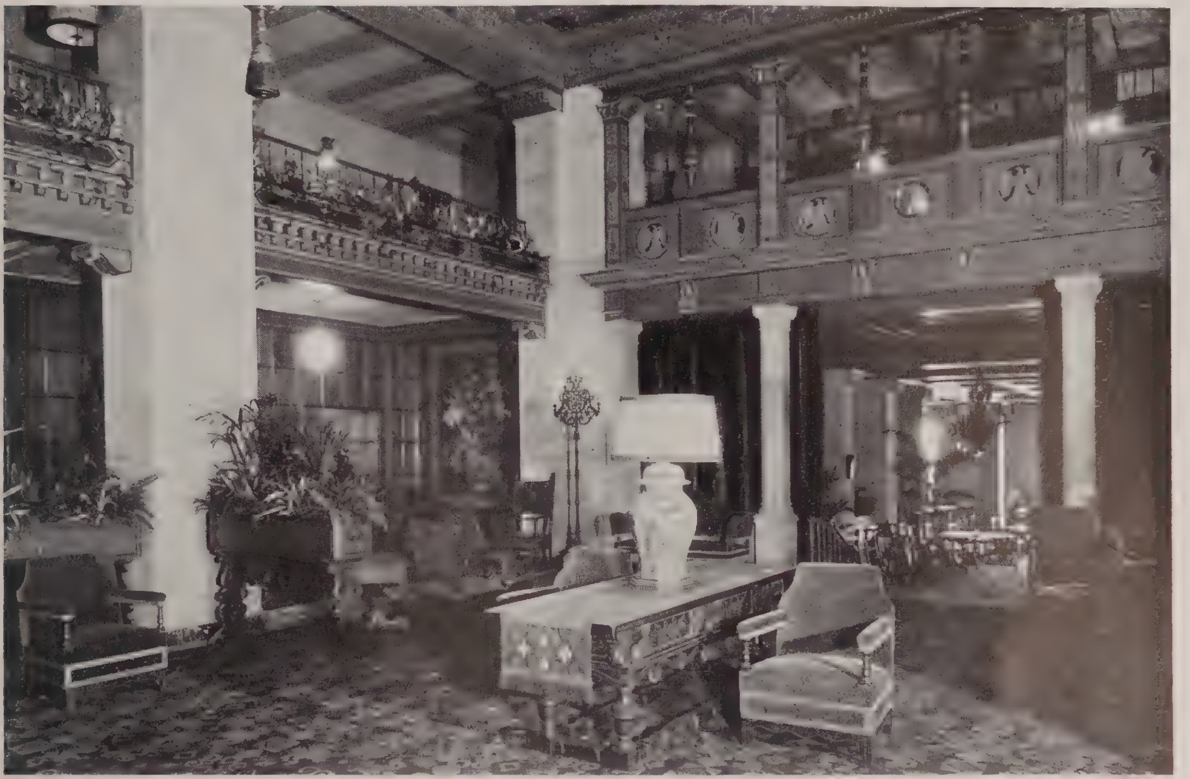


Photo. John Adams Davis

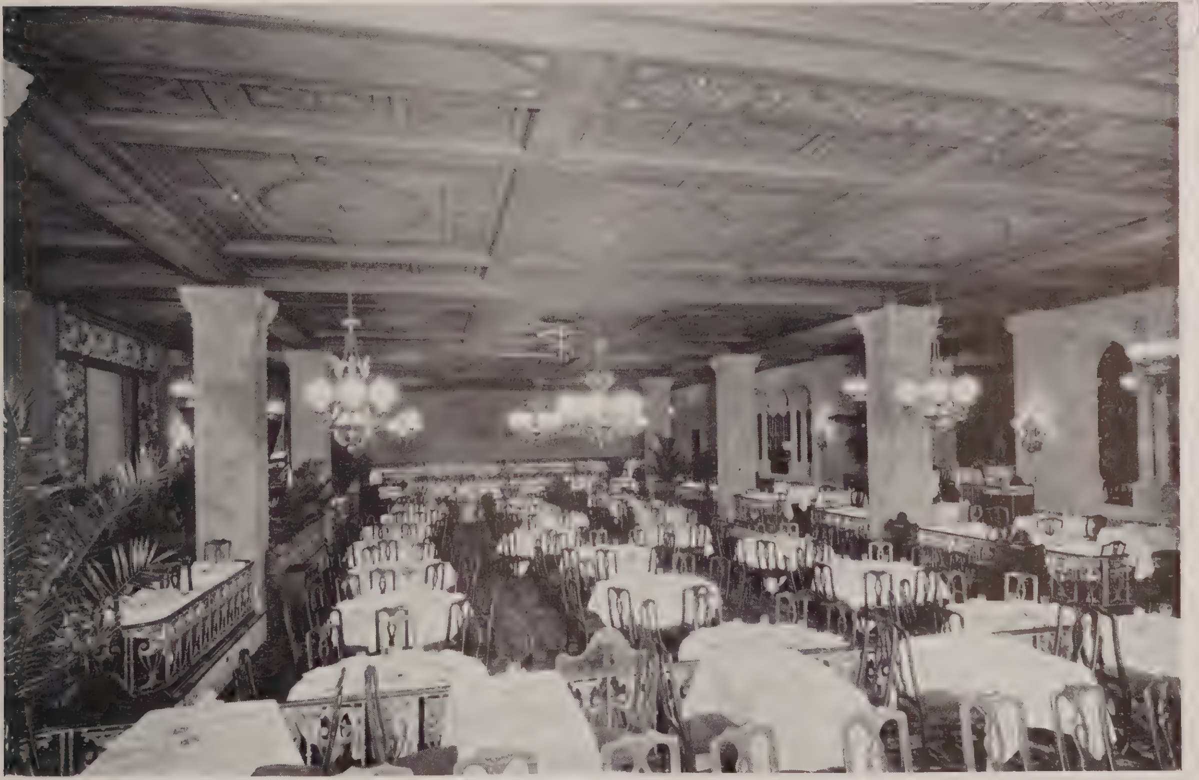
FROM THE ARCHITECTS' PERSPECTIVE SKETCH

HOTEL STATLER, BOSTON

GEORGE B. POST & SONS, ARCHITECTS



LOBBY

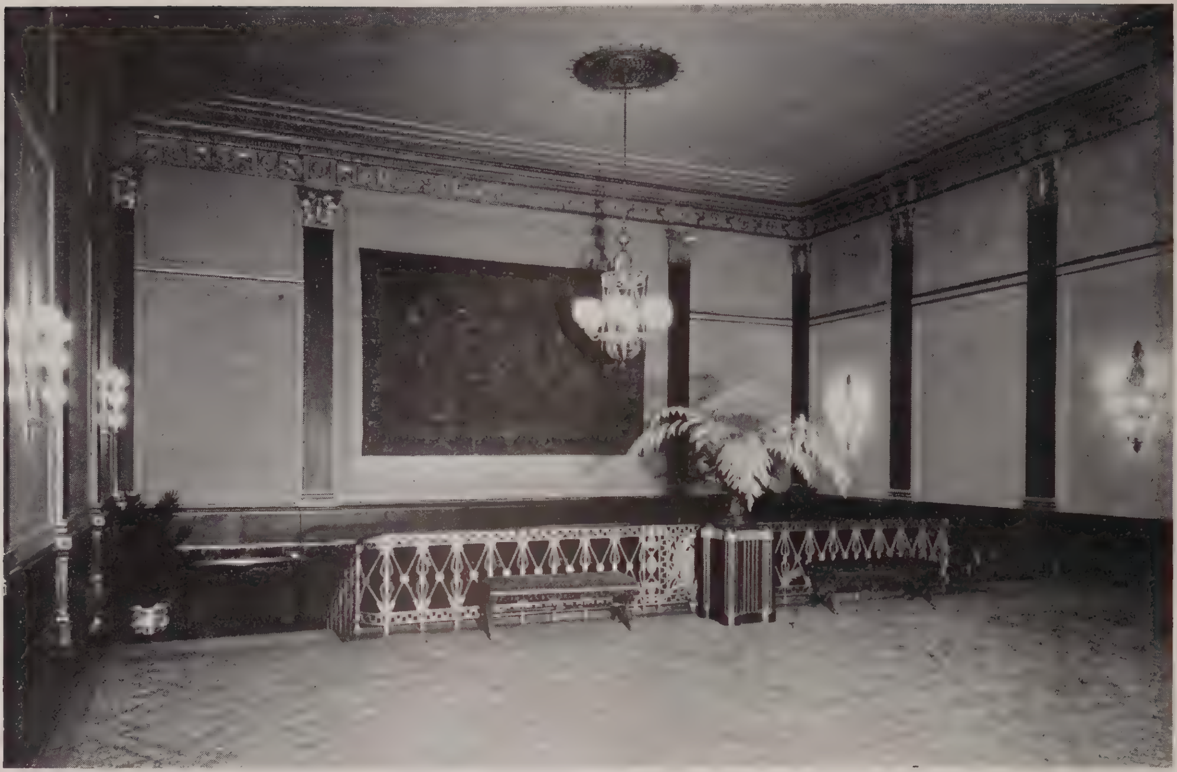


Photos. John Adams Davis

MAIN DINING ROOM

HOTEL STATLER, BOSTON

GEORGE B. POST & SONS, ARCHITECTS



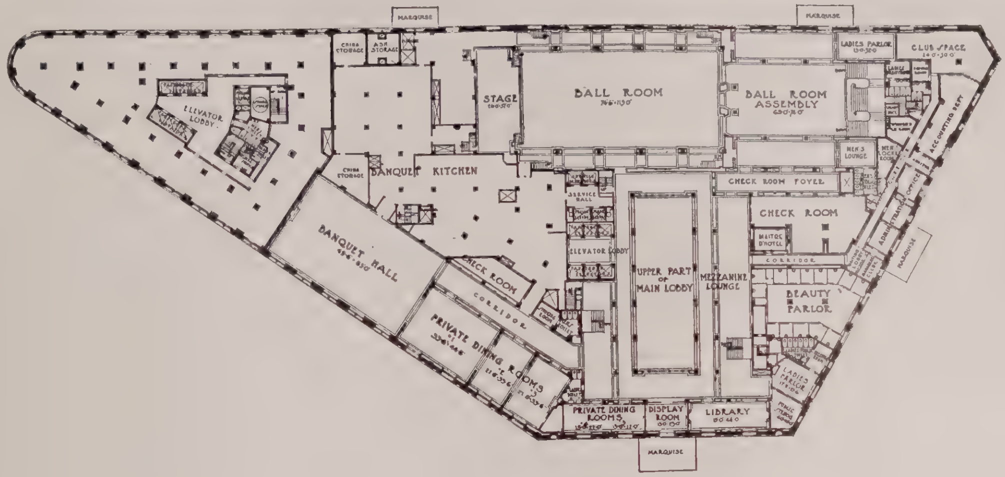
BALL ROOM ASSEMBLY

Photos. John Adams Davis

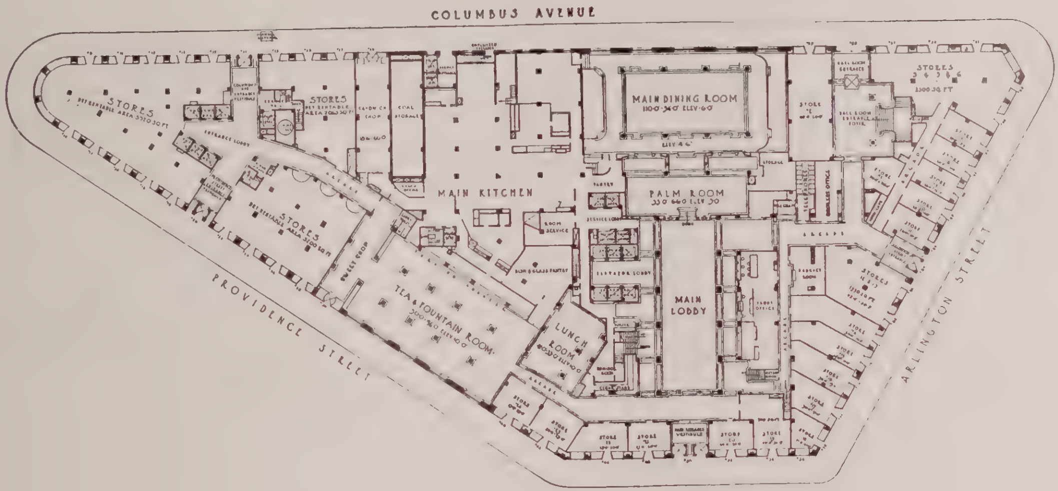
PALM ROOM

HOTEL STATLER, BOSTON

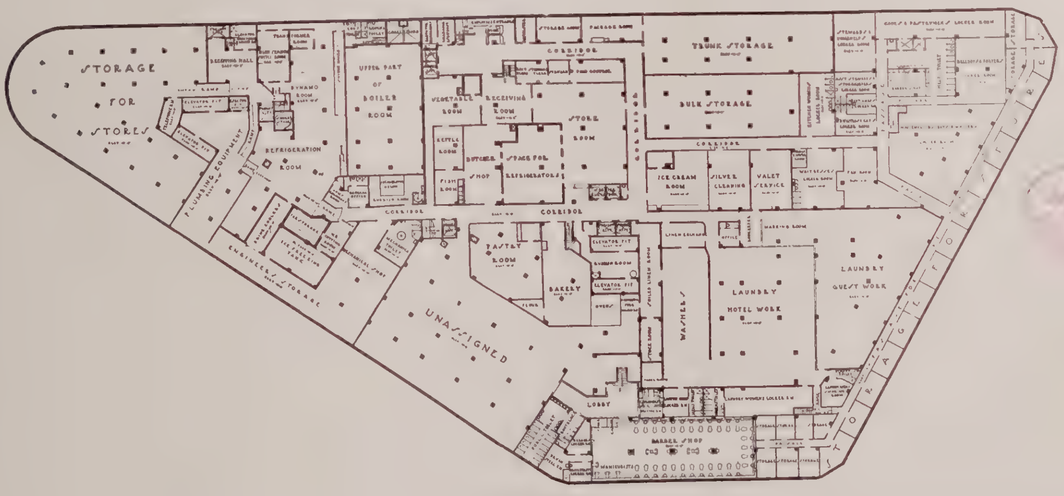
GEORGE B. POST & SONS, ARCHITECTS



SECOND FLOOR

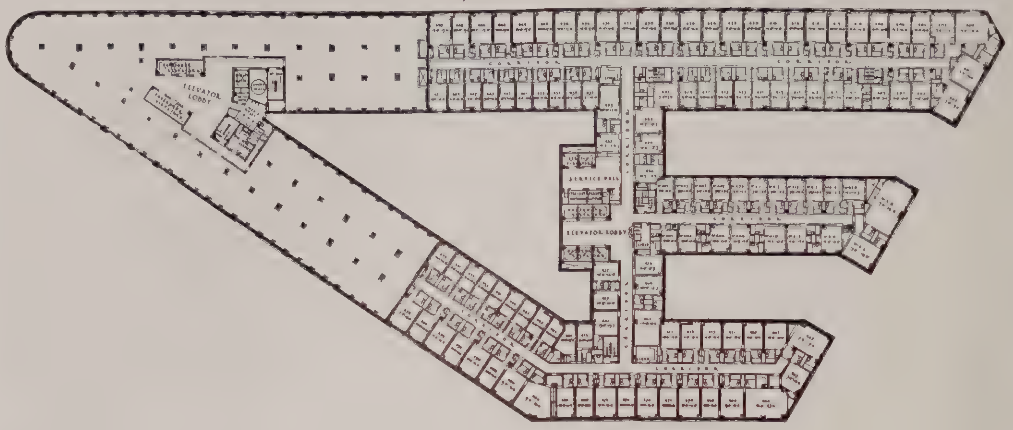


FIRST FLOOR

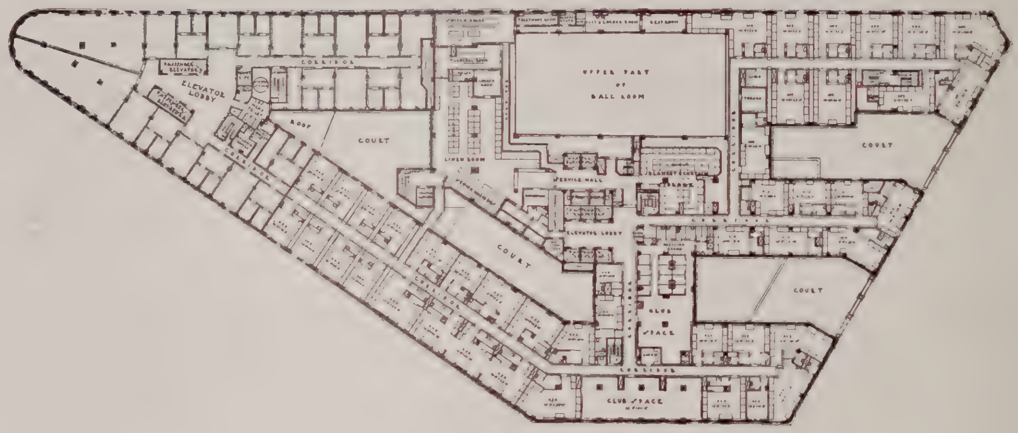


BASEMENT

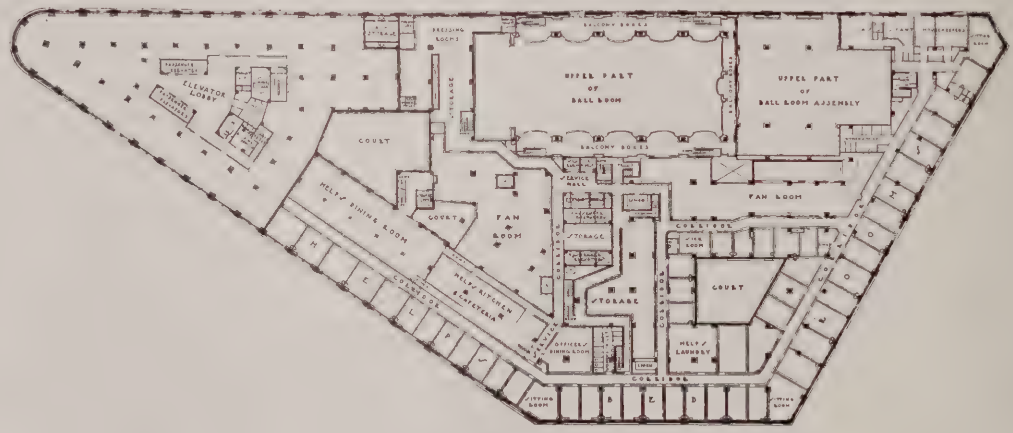
PLANS. HOTEL STATLER, BOSTON
GEORGE B. POST & SONS, ARCHITECTS



SIXTH TO ELEVENTH FLOORS



FOURTH FLOOR



THIRD FLOOR

PLANS. HOTEL STATLER, BOSTON
GEORGE B. POST & SONS, ARCHITECTS

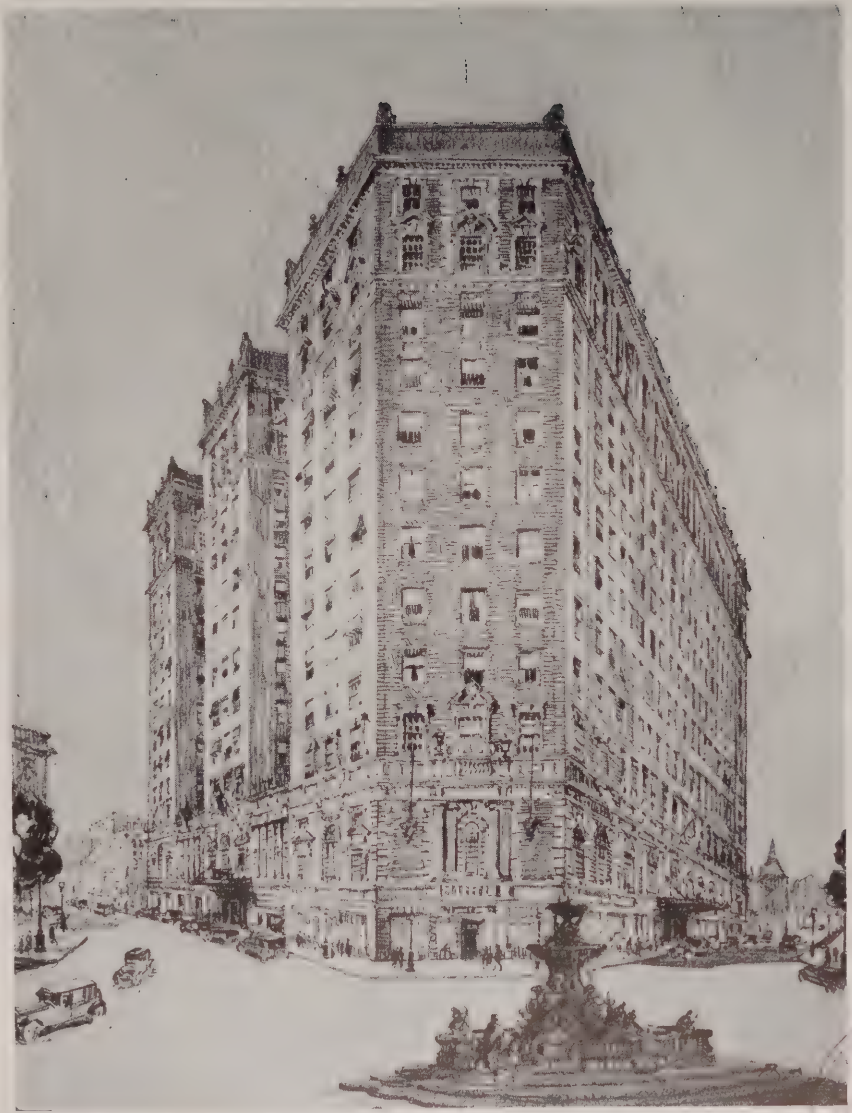
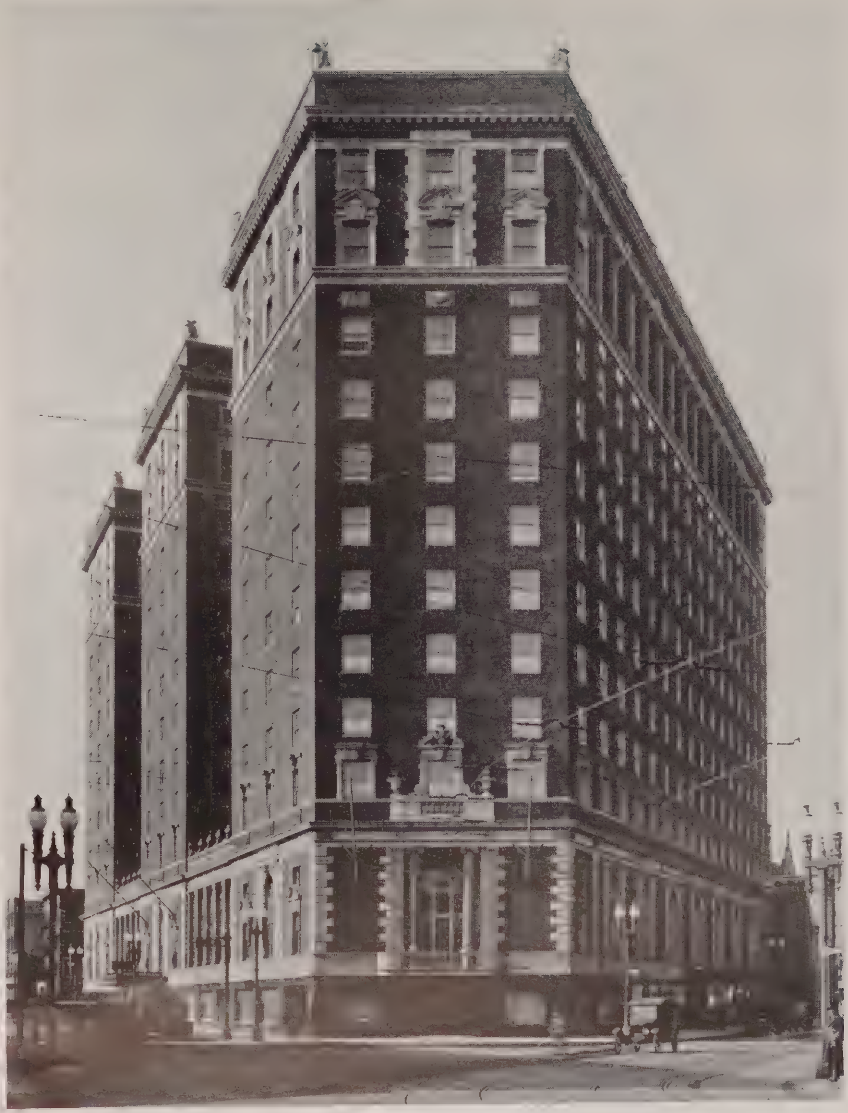


Photo. Smith, Lindsley & Arnoia

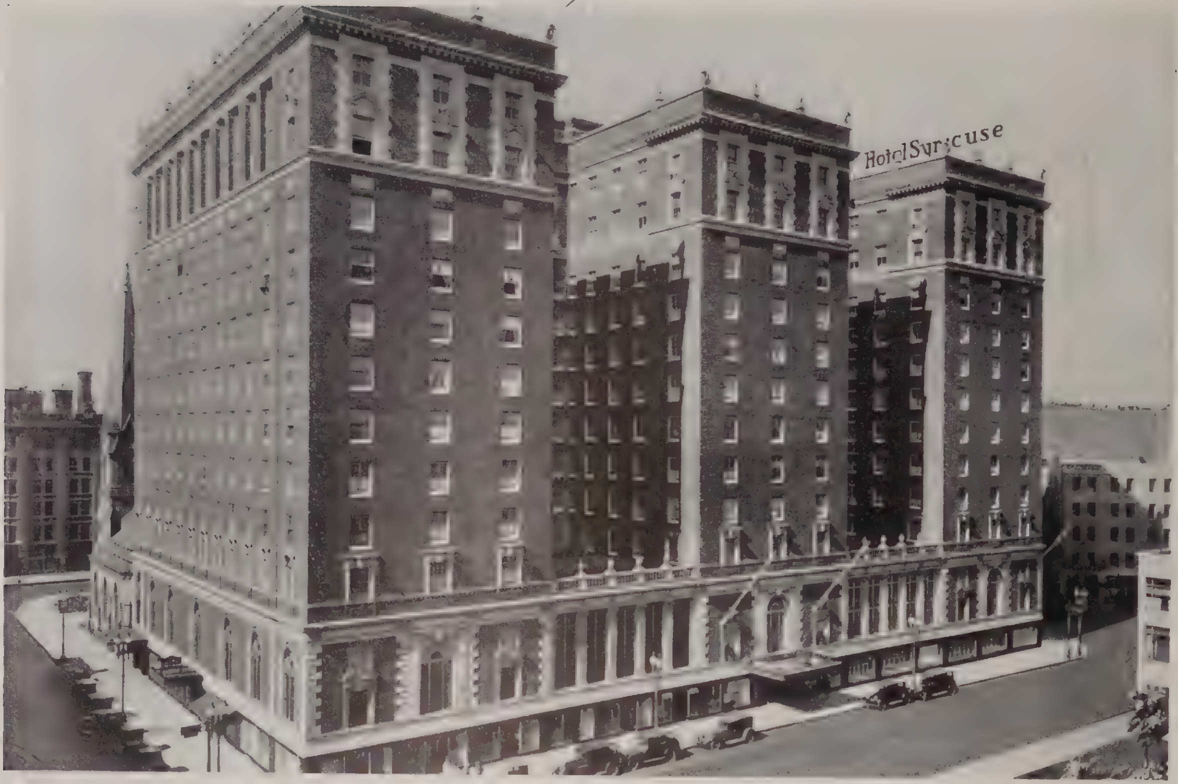
ARCHITECTS' SKETCH



COMPLETED BUILDING

HOTEL SYRACUSE, SYRACUSE

GEORGE B. POST & SONS, ARCHITECTS



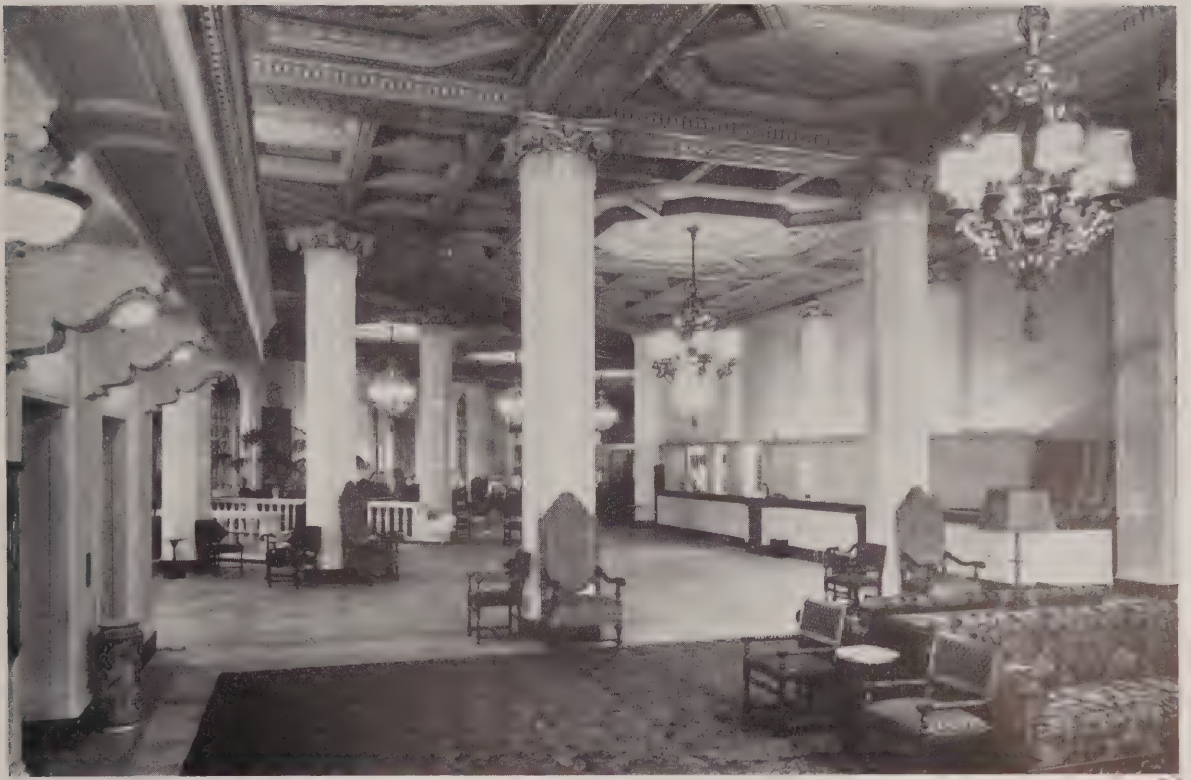
MAIN FACADE

ELEVATOR LOBBY

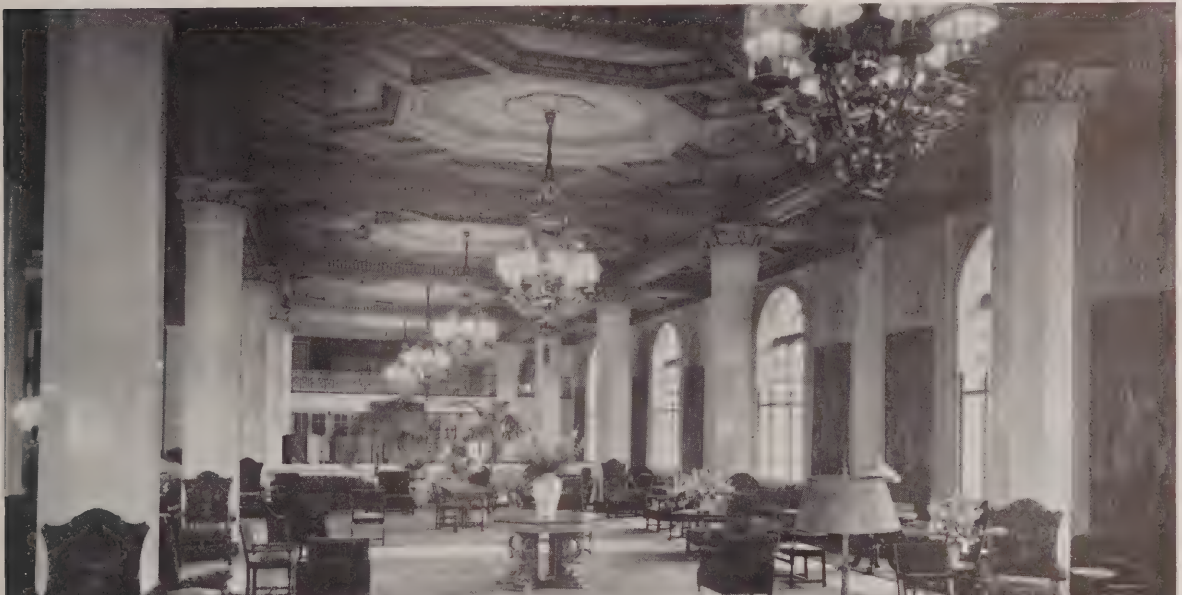
LOBBY LOUNGE

HOTEL SYRACUSE, SYRACUSE

GEORGE B. POST & SONS, ARCHITECTS



OFFICE AND LOUNGE



LOBBY LOUNGE

HOTEL SYRACUSE, SYRACUSE

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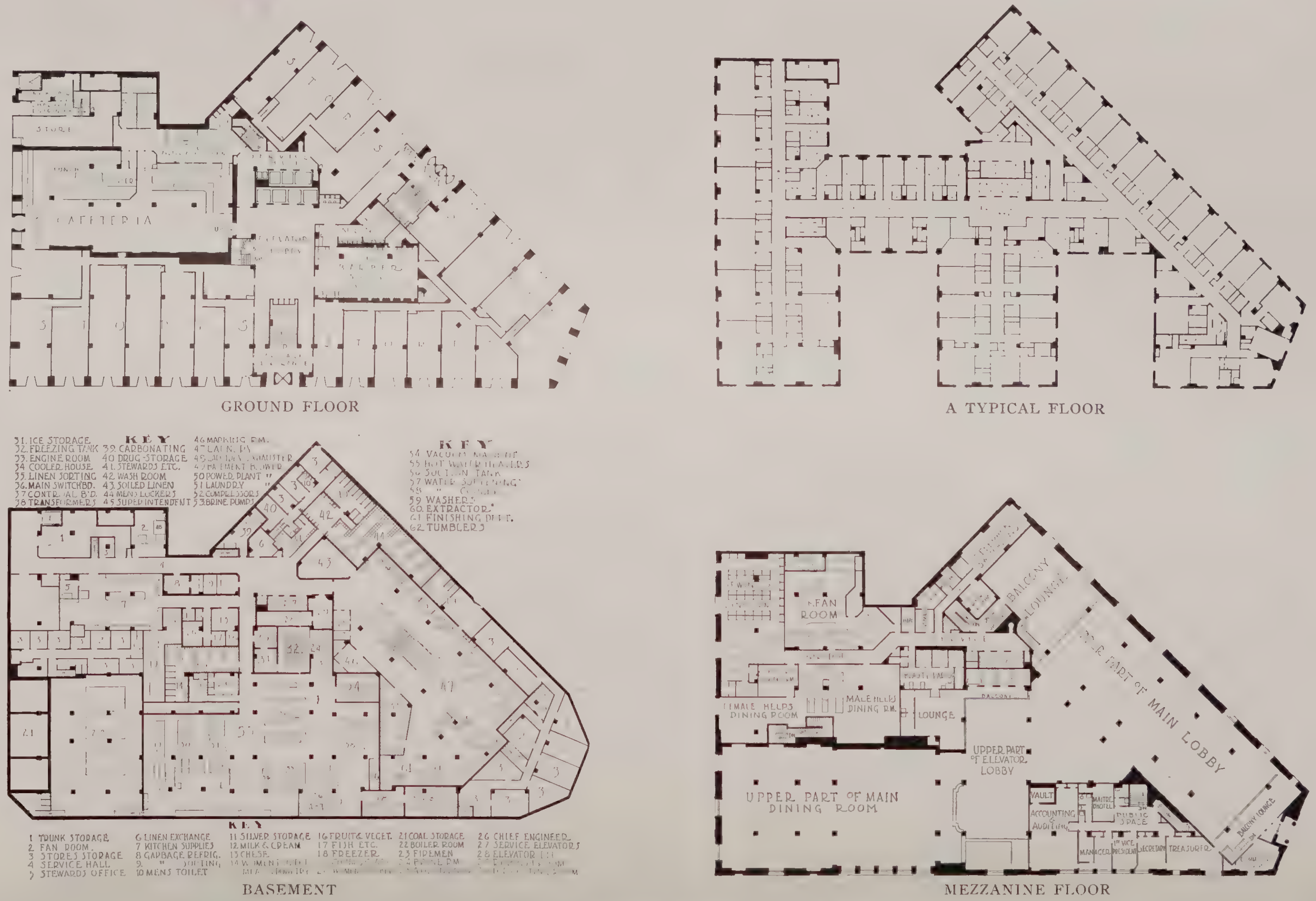


PLANS, HOTEL SYRACUSE, SYRACUSE
GEORGE B. POST & SONS, ARCHITECTS

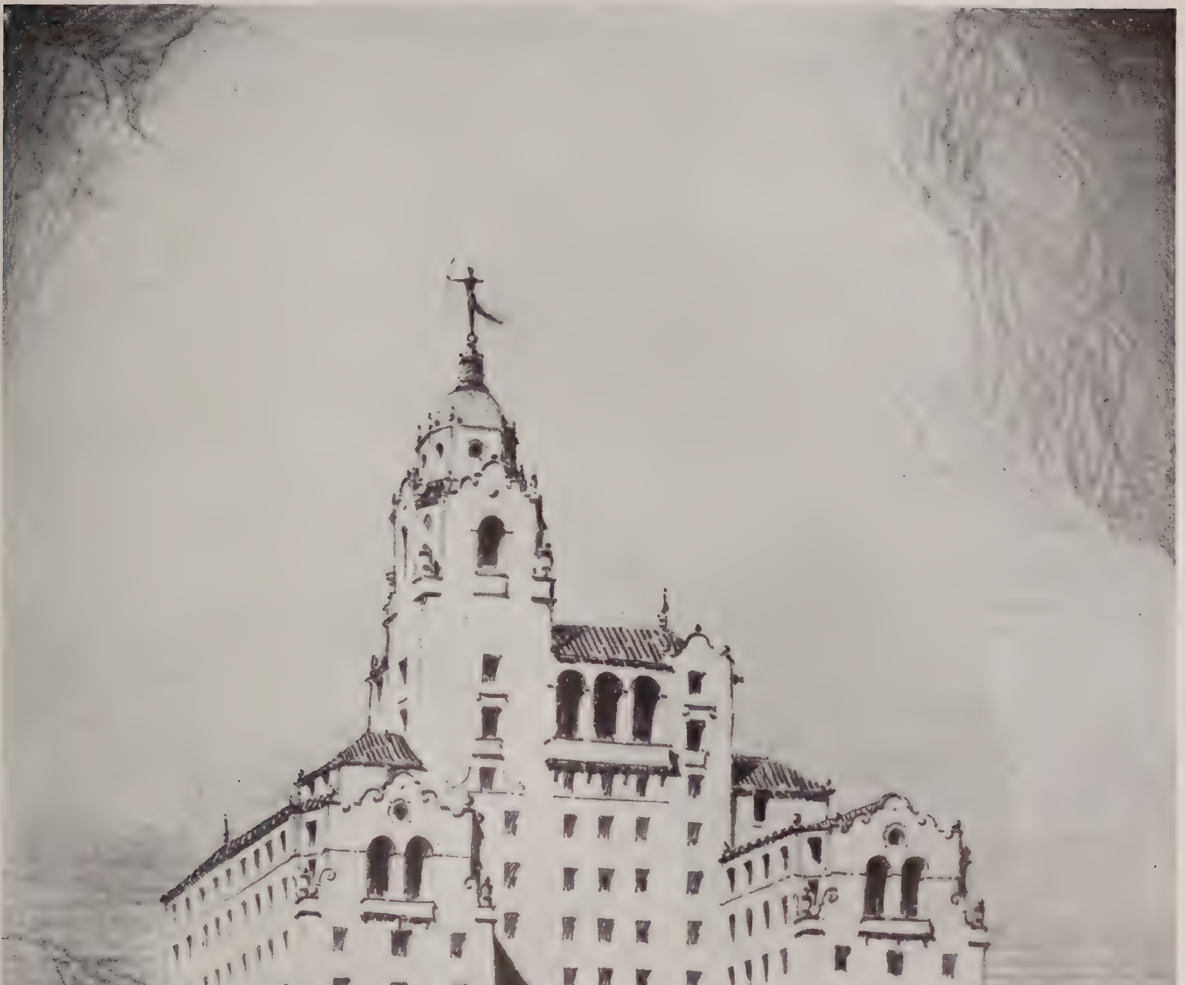
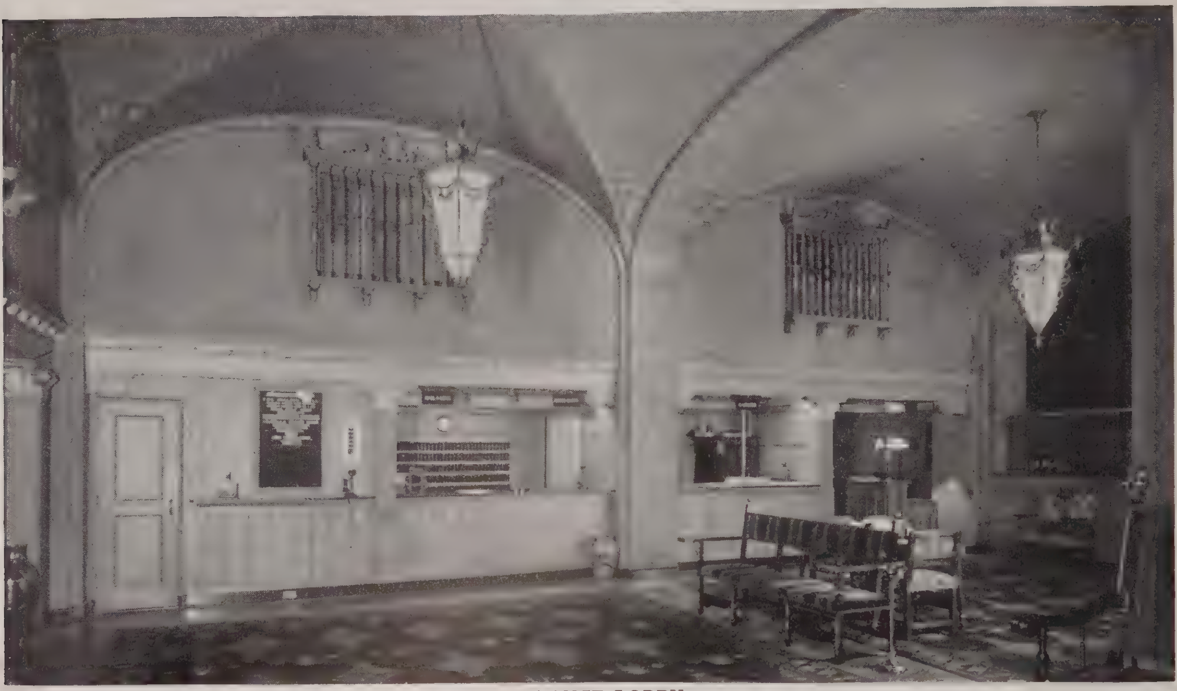


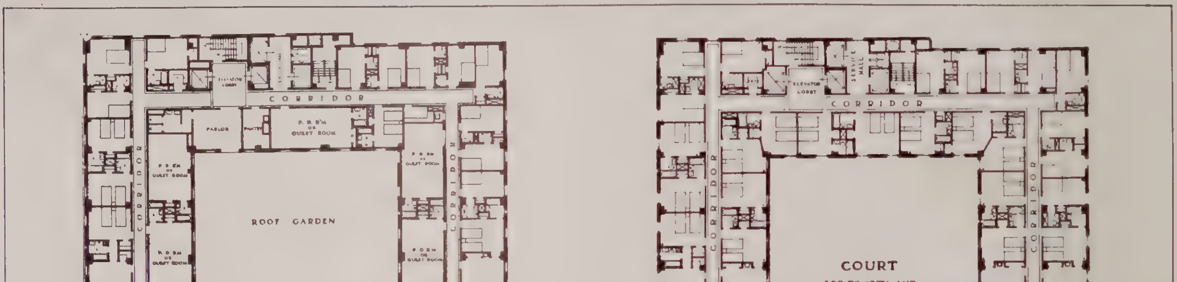
Photo. Wurts Bros.

Plans on Back

FROM THE PERSPECTIVE SKETCH
HALF MOON HOTEL, CONEY ISLAND
GEORGE B. POST & SONS, ARCHITECTS



ENTRANCE LOBBY



SECOND FLOOR

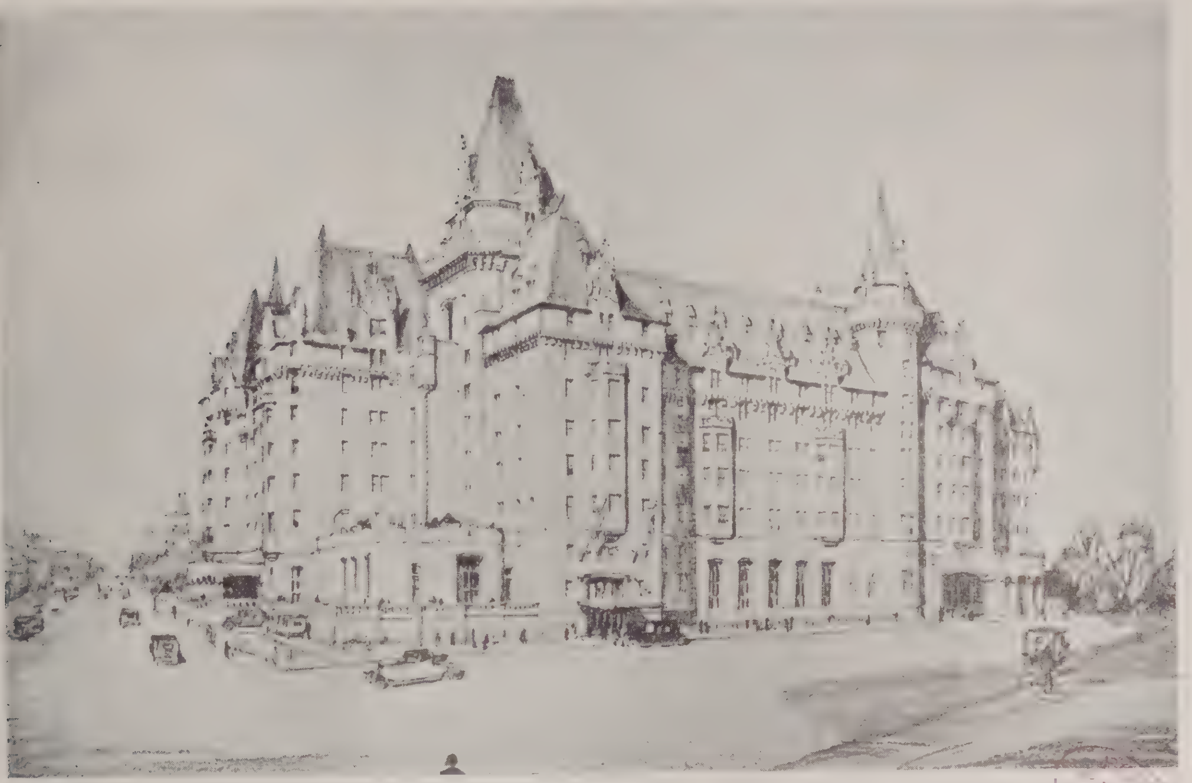
A TYPICAL FLOOR

GROUND FLOOR

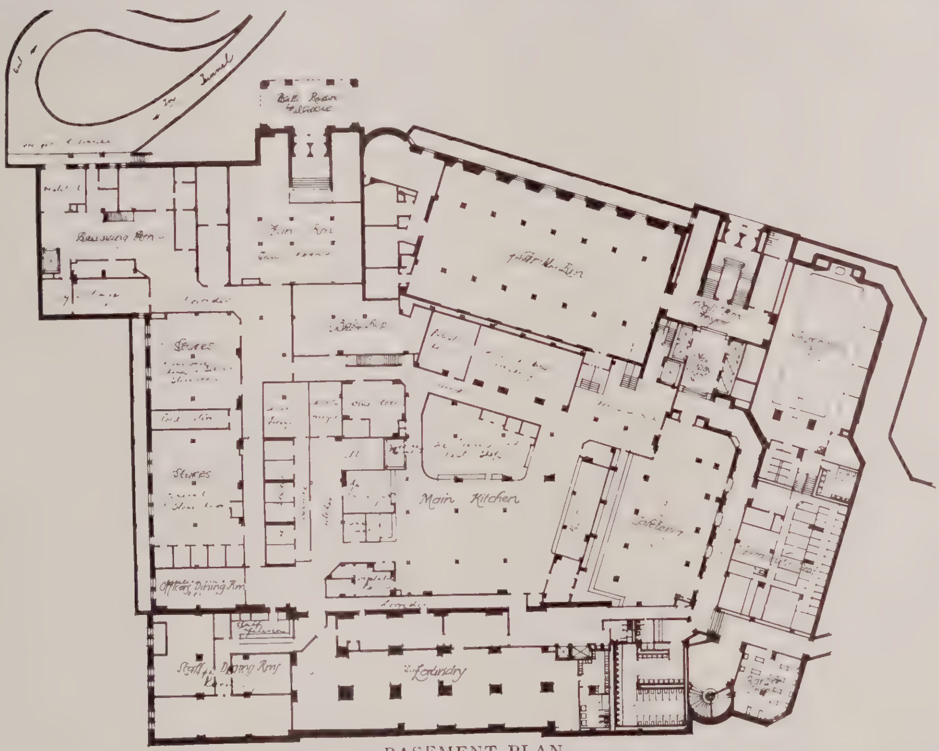
FIRST FLOOR

HALF MOON HOTEL, CONEY ISLAND

GEORGE B. POST & SONS, ARCHITECTS

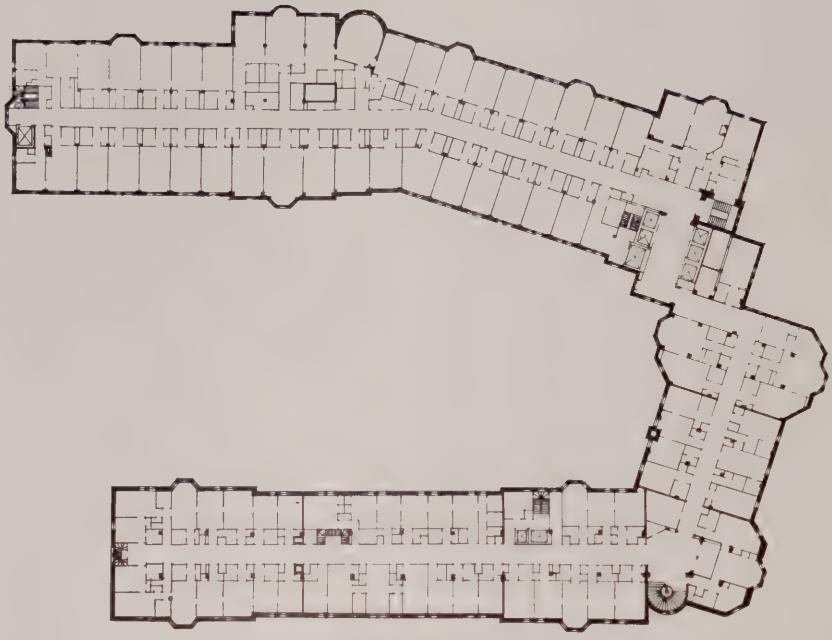


FROM THE ARCHITECT'S SKETCH

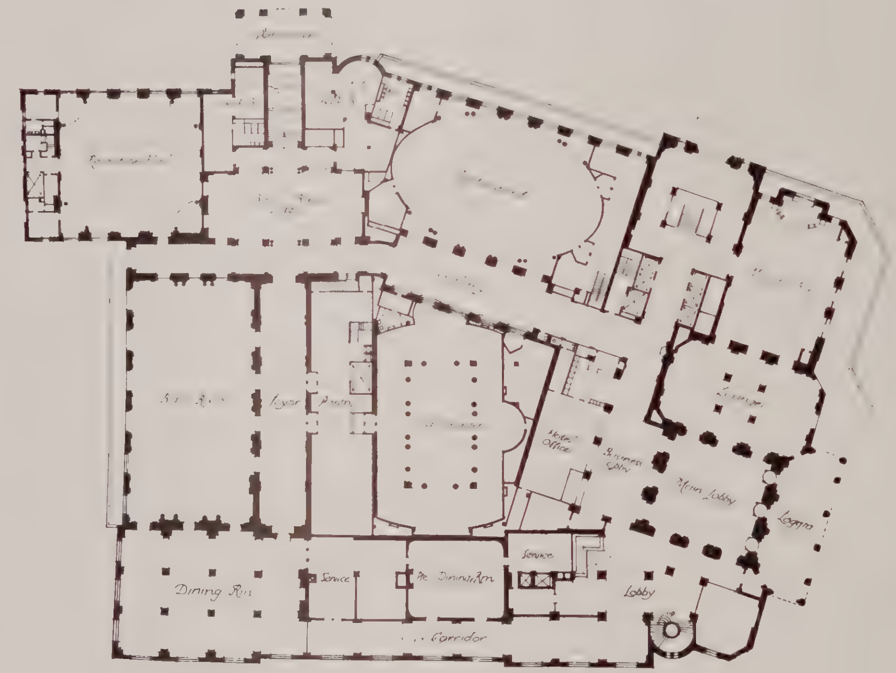


BASEMENT PLAN

CHATEAU LAURIER, OTTAWA
JOHN S. ARCHIBALD, ARCHITECT
JOHN SCHOFIELD, ASSOCIATED

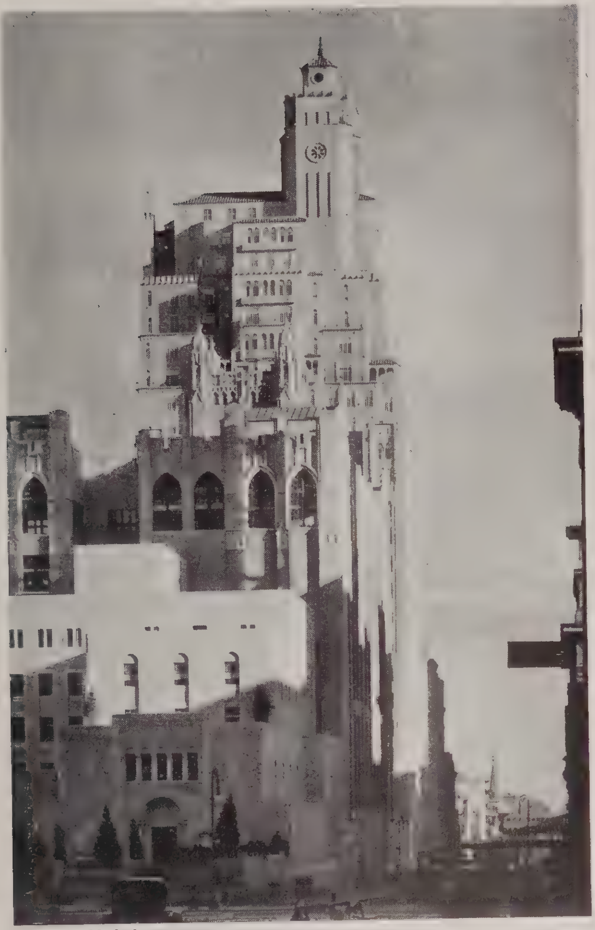


A BEDROOM FLOOR



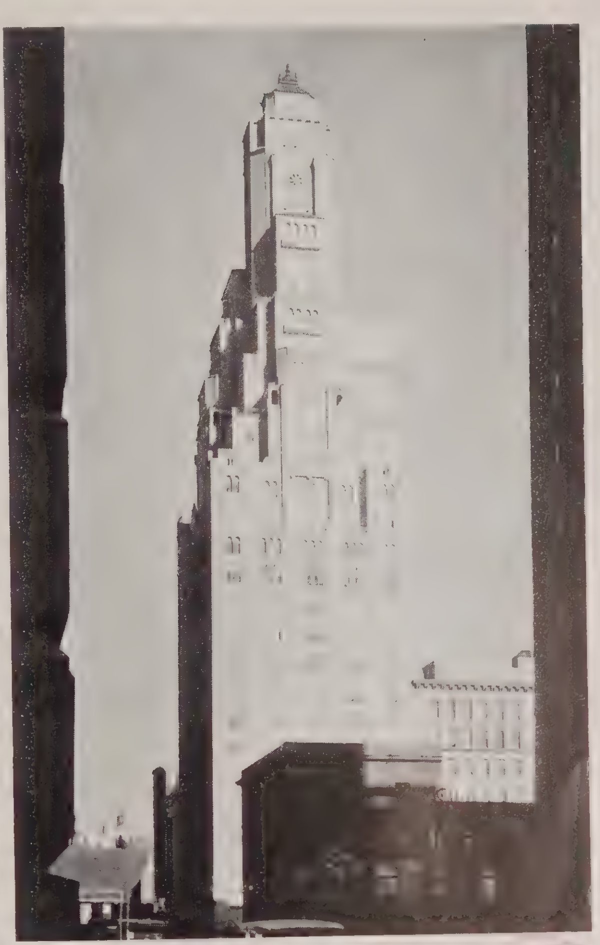
GROUND FLOOR

PLANS. CHATEAU LAURIER, OTTAWA
JOHN S. ARCHIBALD, ARCHITECT
JOHN SCHOFIELD, ASSOCIATED

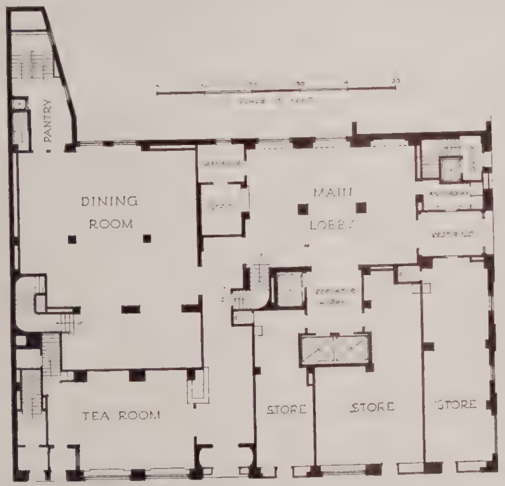


Photos. Nyholm

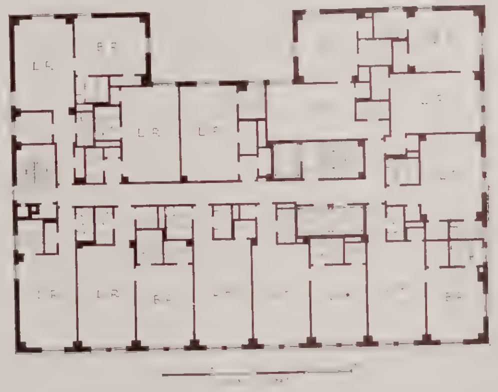
VIEW FROM PARK AVENUE



VIEW FROM LEXINGTON AVENUE



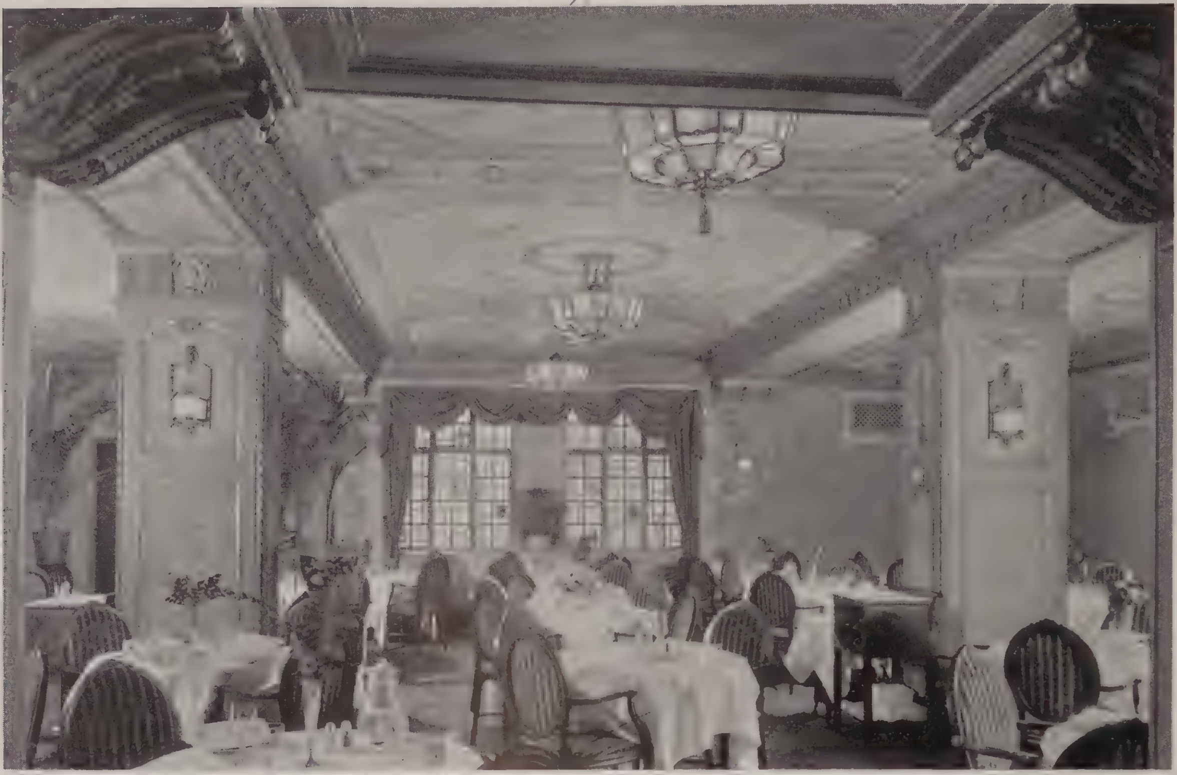
FIRST FLOOR PLAN



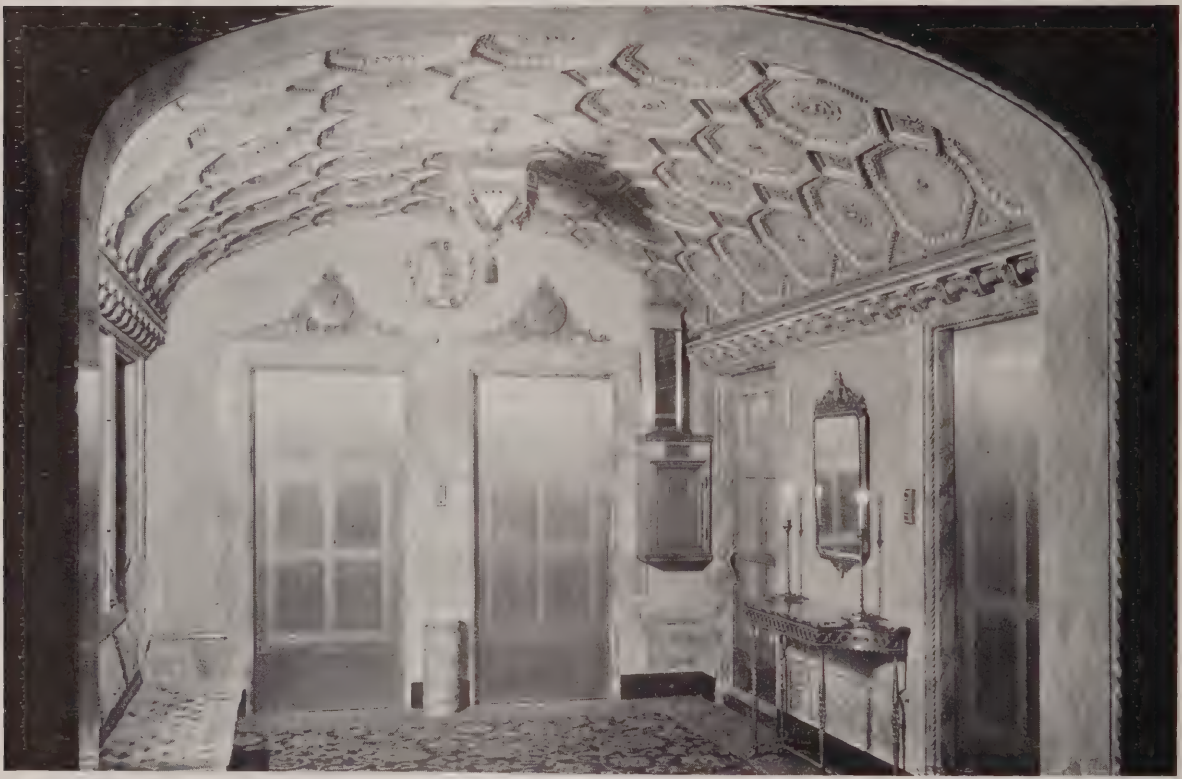
TYPICAL FLOOR PLAN

HOTEL BEVERLY, NEW YORK

EMERY ROTH, ARCHITECT
SYLVAN BIEN, ASSOCIATED



DINING ROOM



ELEVATOR LOBBY

HOTEL BEVERLY, NEW YORK

EMERY ROTH, ARCHITECT
SYLVAN BIEN, ASSOCIATED

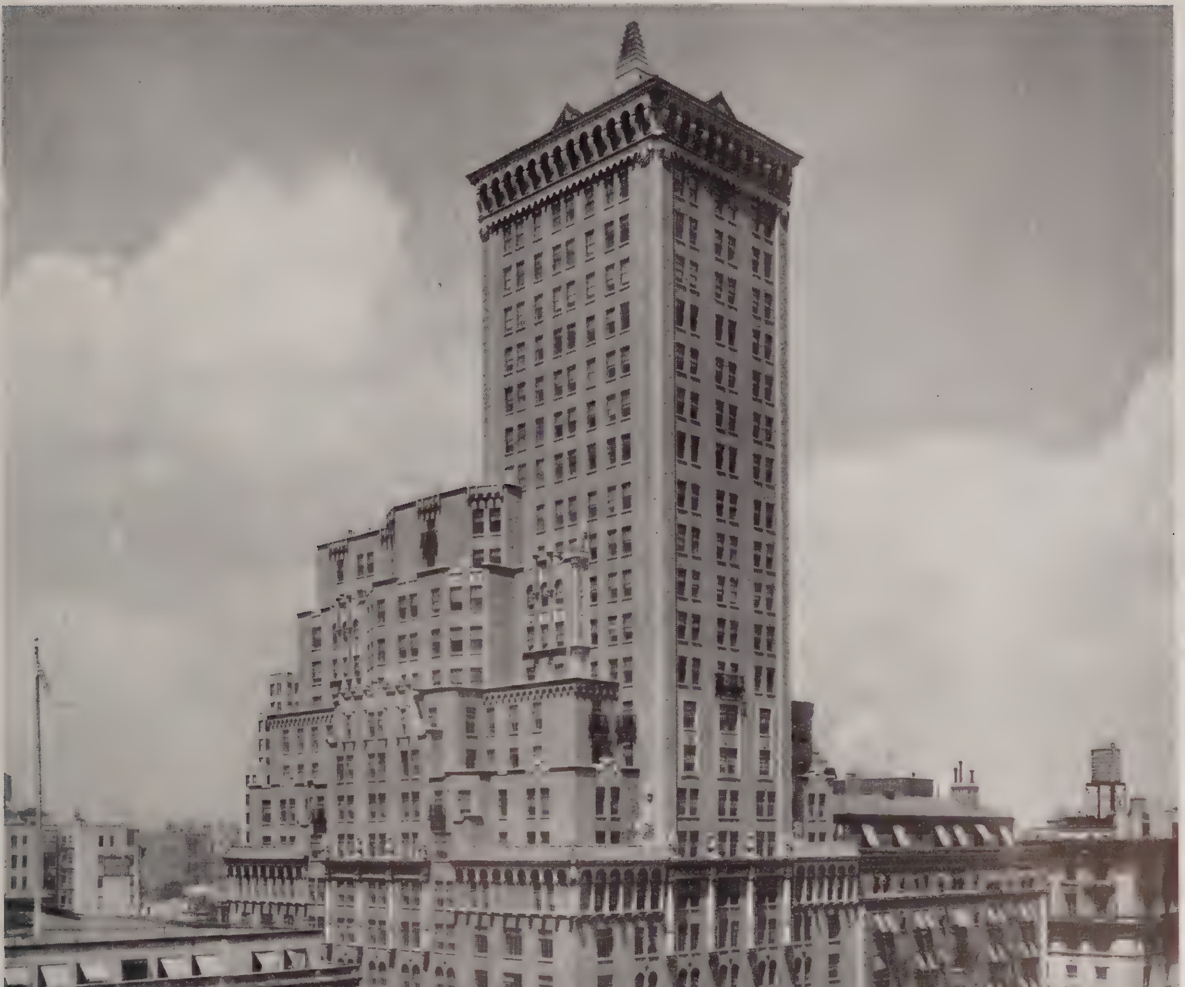
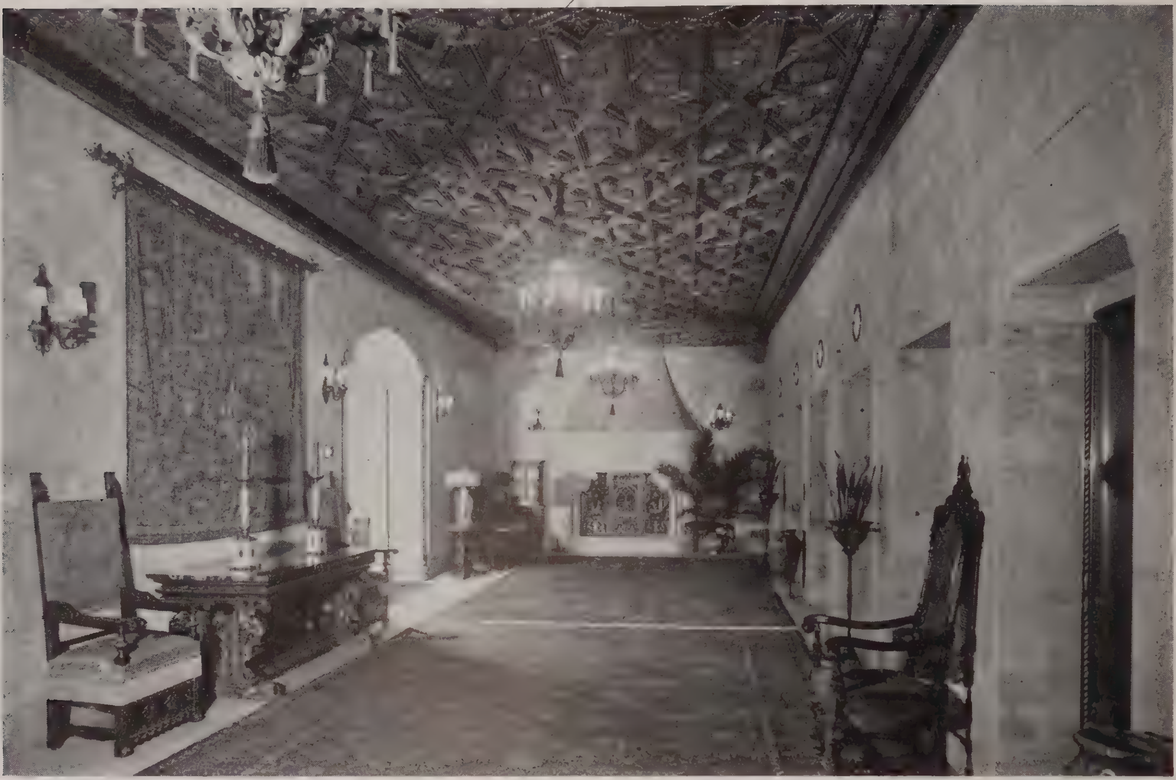


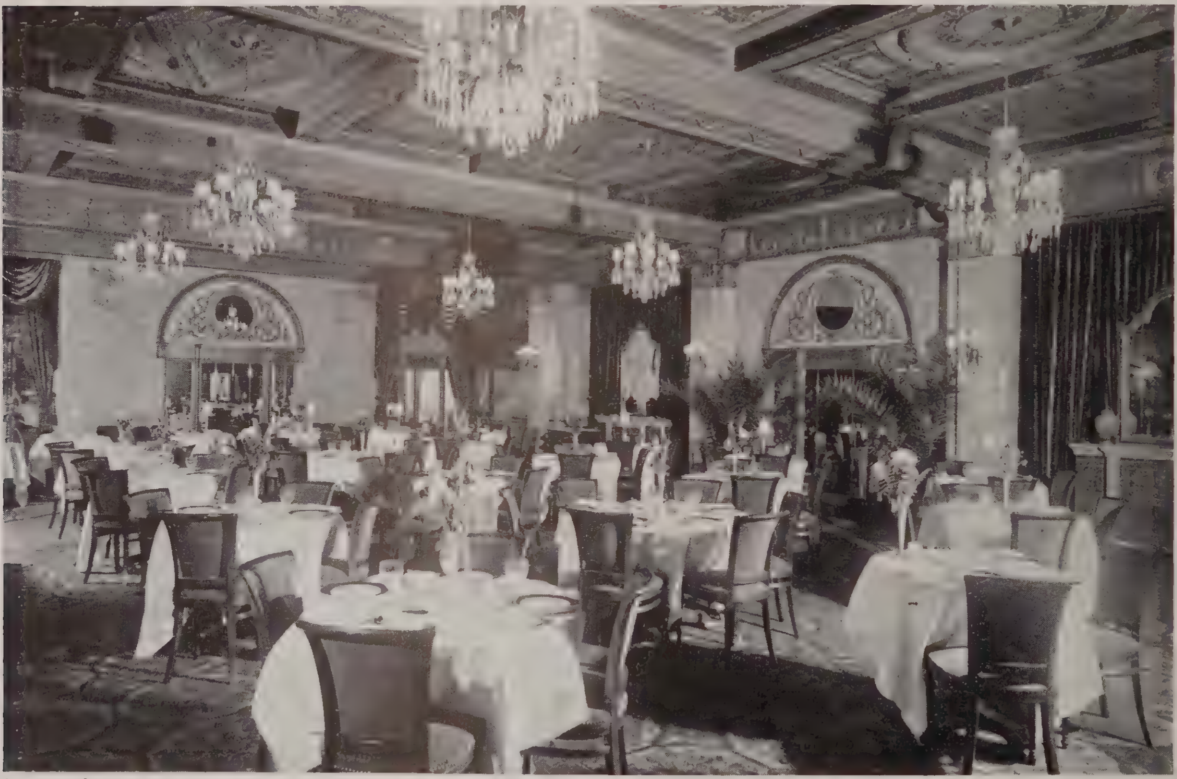
Photo. Wurts Bros.

HOTEL DELMONICO, NEW YORK

GOLDNER & GOLDNER, ARCHITECTS



ENTRANCE FOYER

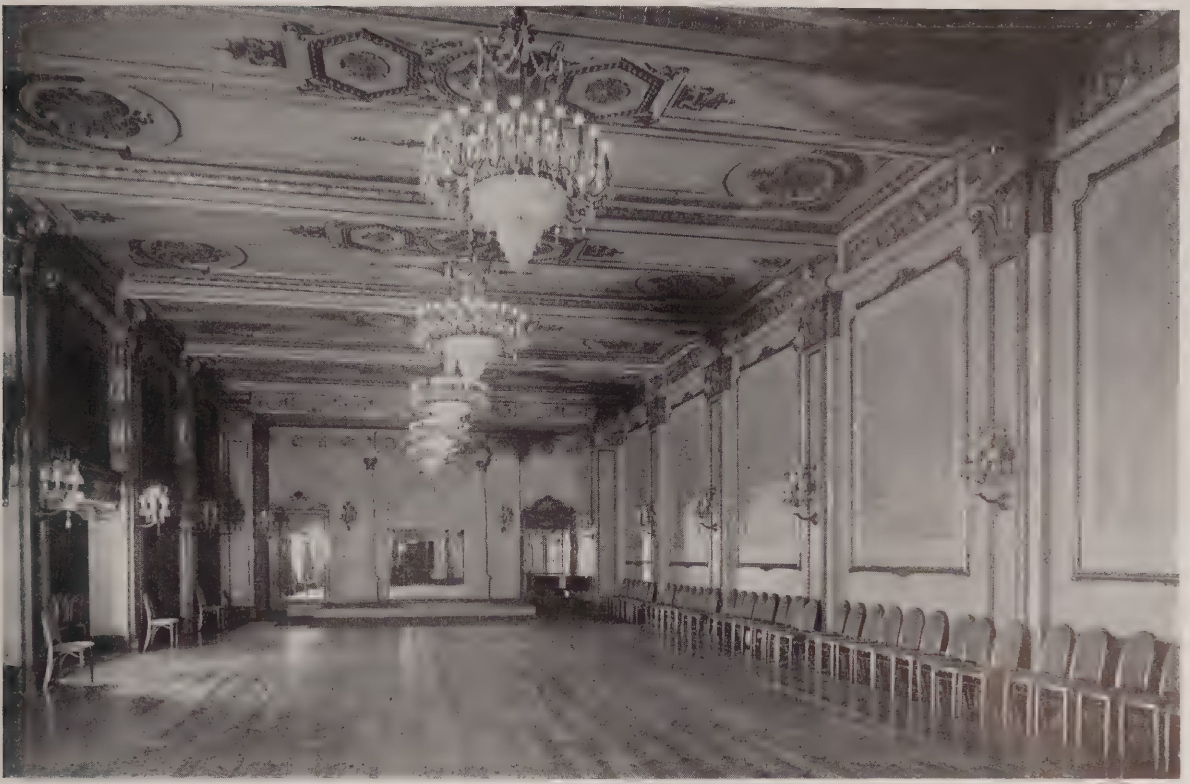


Photos. Amemya

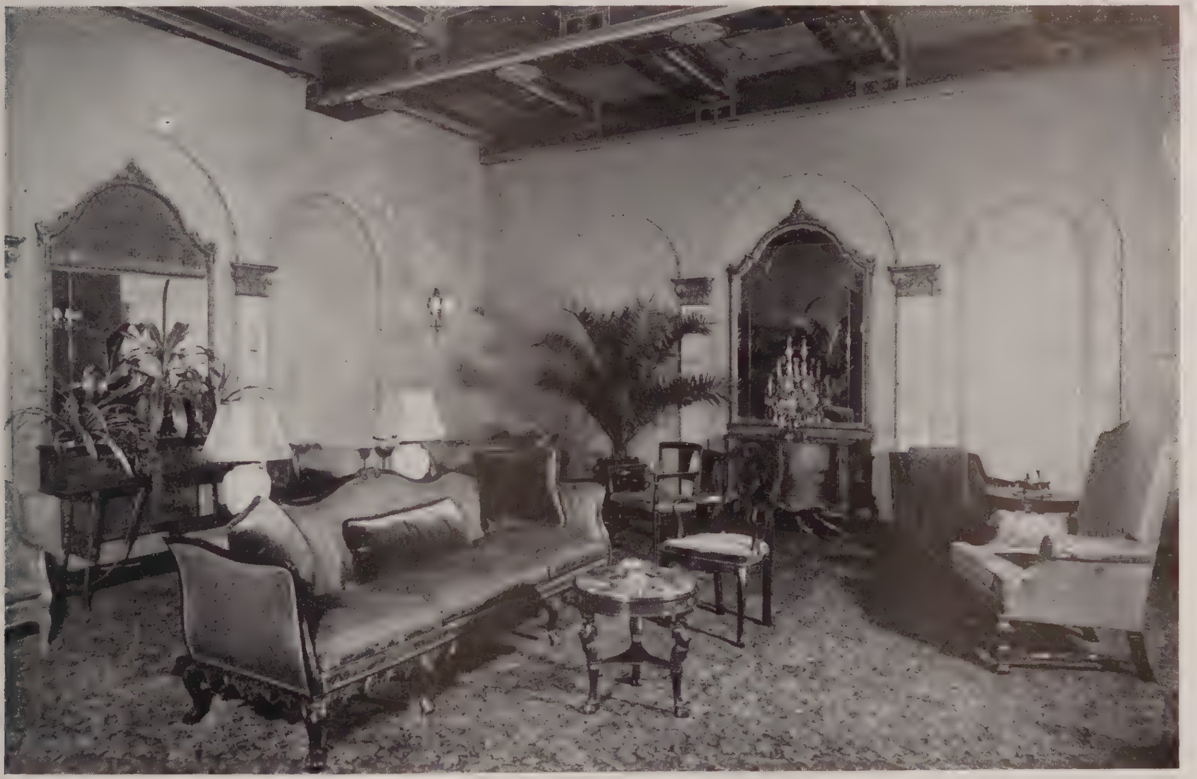
MAIN DINING ROOM

HOTEL DELMONICO, NEW YORK

GOLDNER & GOLDNER, ARCHITECTS



BALL ROOM



RECEPTION ROOM

HOTEL DELMONICO, NEW YORK

GOLDNER & GOLDNER, ARCHITECTS

HOTEL DECORATIONS AND FURNISHINGS

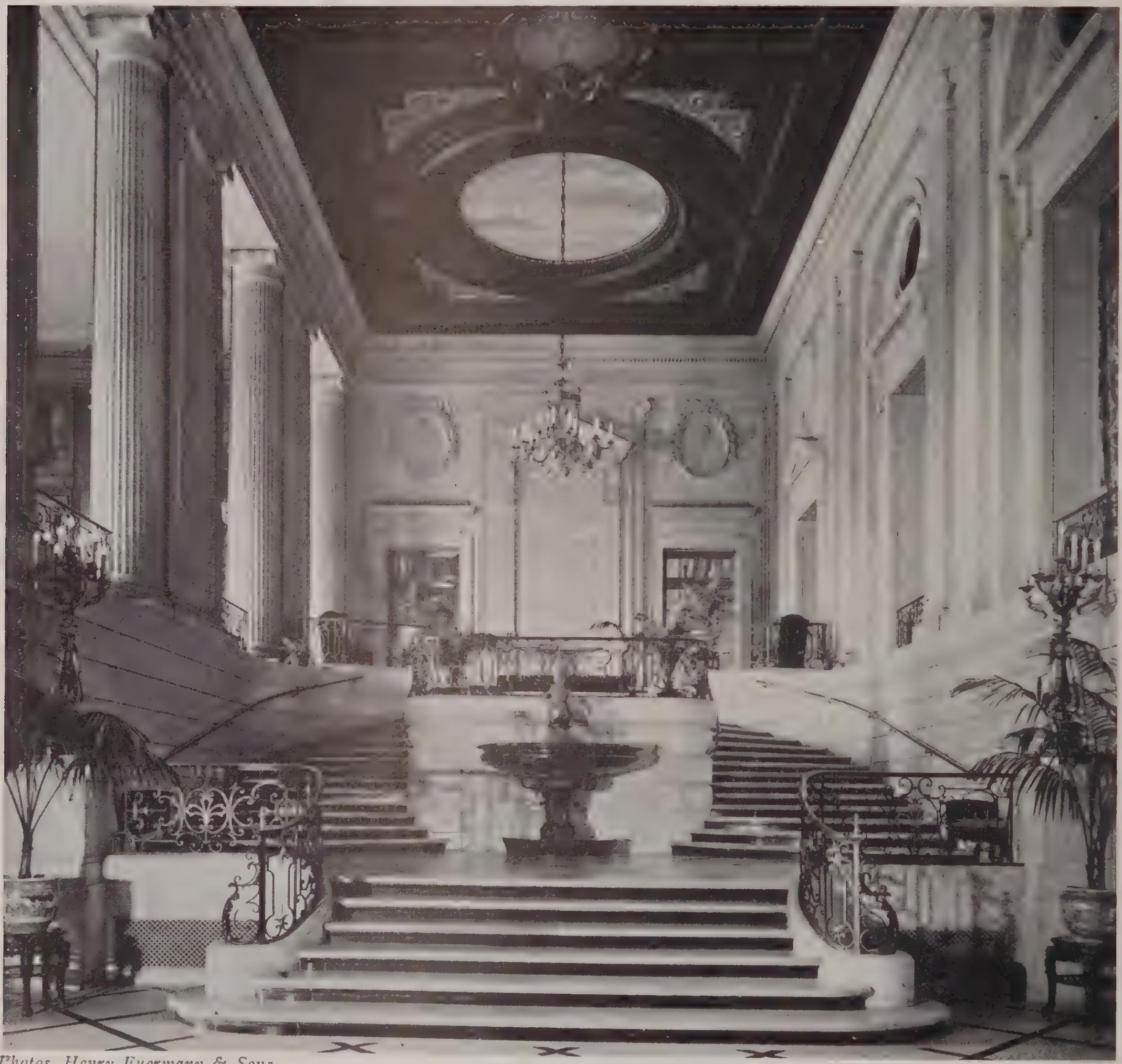
BY

HENRY J. B. HOSKINS
OF THE FIRM OF HOLABIRD & ROOT

AN understanding of the decorative requirements and the furnishings of the modern hotel cannot well be arrived at without delving into the past to some extent. In the pursuit of this pleasant pastime one cannot help but be impressed with the similarity of service rendered, though in many and varied manners, by those who have endeavored to make the life of the traveling public more pleasant, or to give zest to those upon whose hands, for various reasons, time has hung heavily.

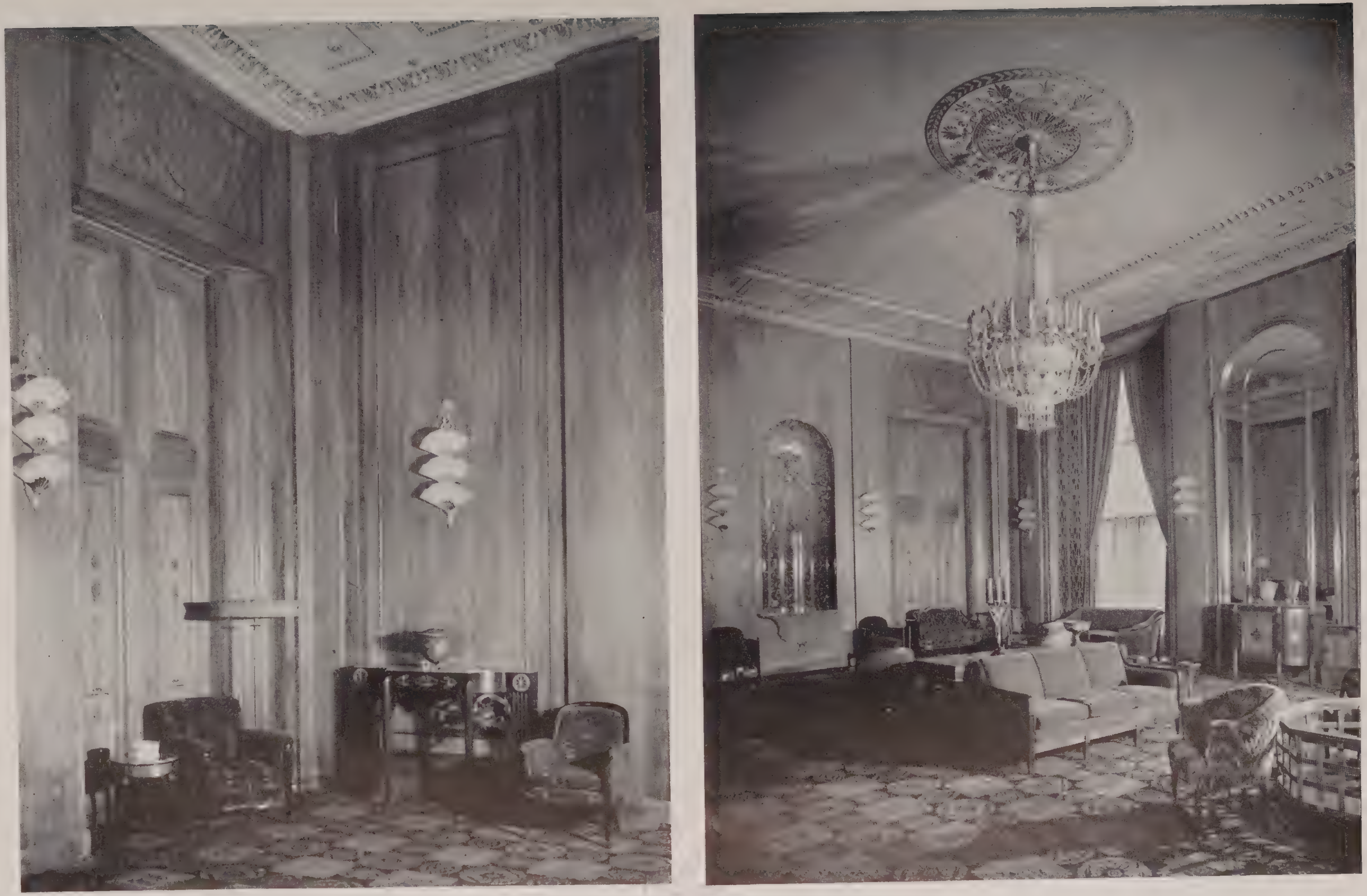
The metamorphosis of the hotel has been slow but sure. Standing as it does on traveled highways, it has felt the transforming effect of all the varied modes of transportation, from the sedan chair and stage coach to the bicycle, train and automobile. The ease and growth of means of transportation, the vast increase of population, and the migratory nature of a large portion of it created a need for an enormous amount of hotel accommodation. The location of railroad depots, the concentration of commercial centers, etc., brought about a need for the concentration of hotel space, and in place of the scattered small hotels, each with its gaily swinging sign, there resulted the mammoth structures of today.

Their requirements are many, and vary from



Photos. Henry Fuermann & Sons

Ball Room Foyer
Hotel Schroeder, Milwaukee
Holabird & Root, Architects

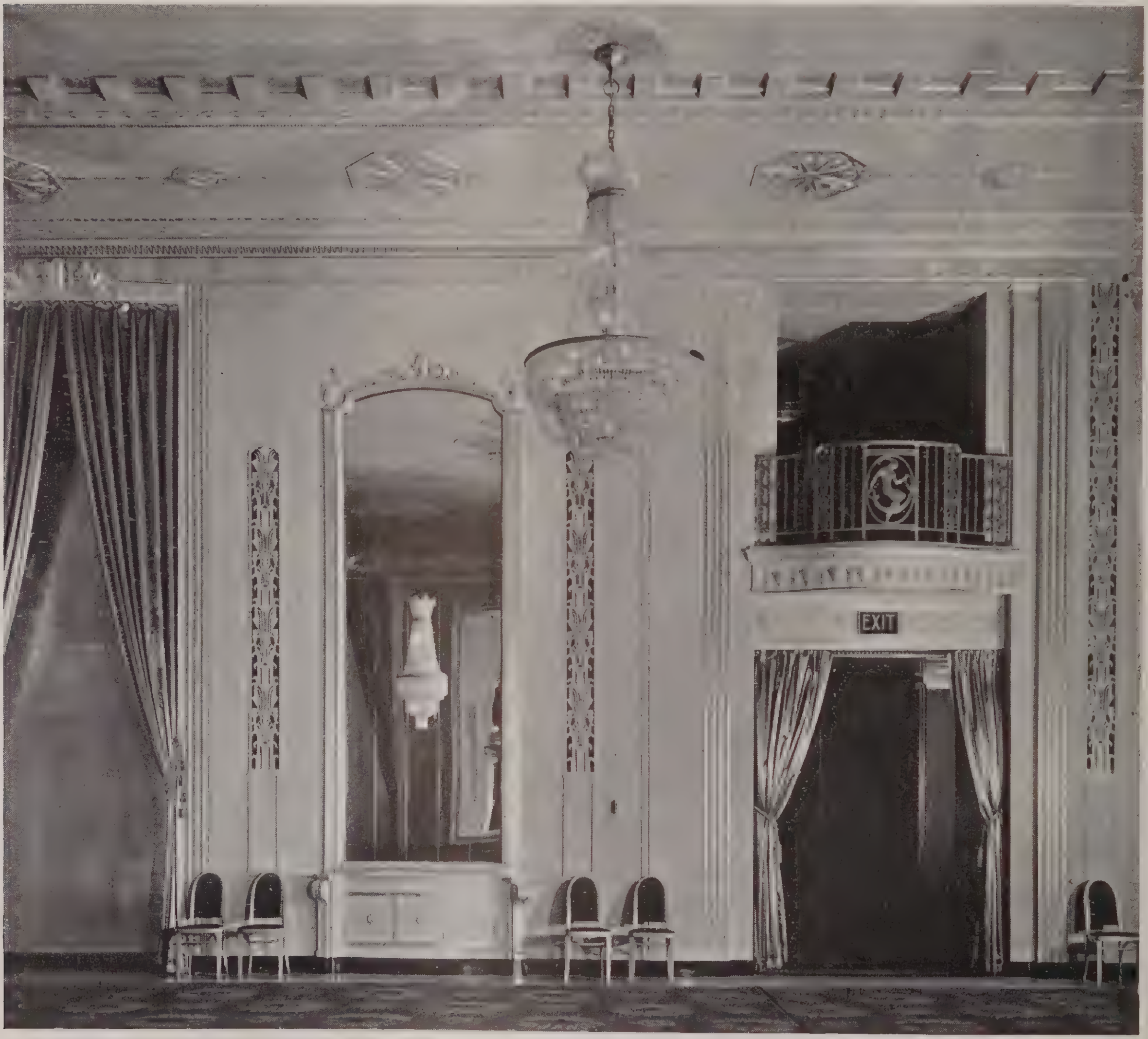


DETAILS OF THE MAIN LOUNGE
HOTEL SCHROEDER, MILWAUKEE
Holabird & Root, Architects

the need of affording a few hours' or days' rest to the traveling transient to providing winter quarters for the fortunate few, or homes for permanent guests. At all times and in all its varied forms, whether ale house inn, tavern or hotel, the paramount purpose of the hotel was comfort,—comfort and rest for the wearied traveler, and in these days comfort and leisure, an escape from business worries in an environment of restful ease, or the provision of all the comforts of a home with none of the care and trouble that go with it.

These different forms of hotel life and accommodation present peculiar problems of decorating and furnishing. In the early days, previous to the development of the industrial era, there seems to have been but little difficulty. The buildings were designed as units inside and out and were fitted up, decorated and furnished in the prevailing mode or style of the times, and with the relatively slow growth or change in decorative ideas they became a true expression of the needs of their day, and were practically and artistically satisfactory. Those were the happy days when contemporary life was expressed in architecture and other arts in a homogeneous manner, with each style or period developing slowly from that preceding in its conformity to the requirements of the day and to ideas resulting from foreign travel.

With the growth of industry, the development of a mechanical age, and the advancement of commerce, artistic progress and endeavor seemed to suffer a corresponding decline, reaching a point where the continuity of growth practically ceased and the principal function of the designer in the field of furniture and decoration became that of an adapter of pre-conceived styles to the purposes of later days. Classic, Elizabethan, Jacobean, Georgian, Spanish, Italian and the whole gamut

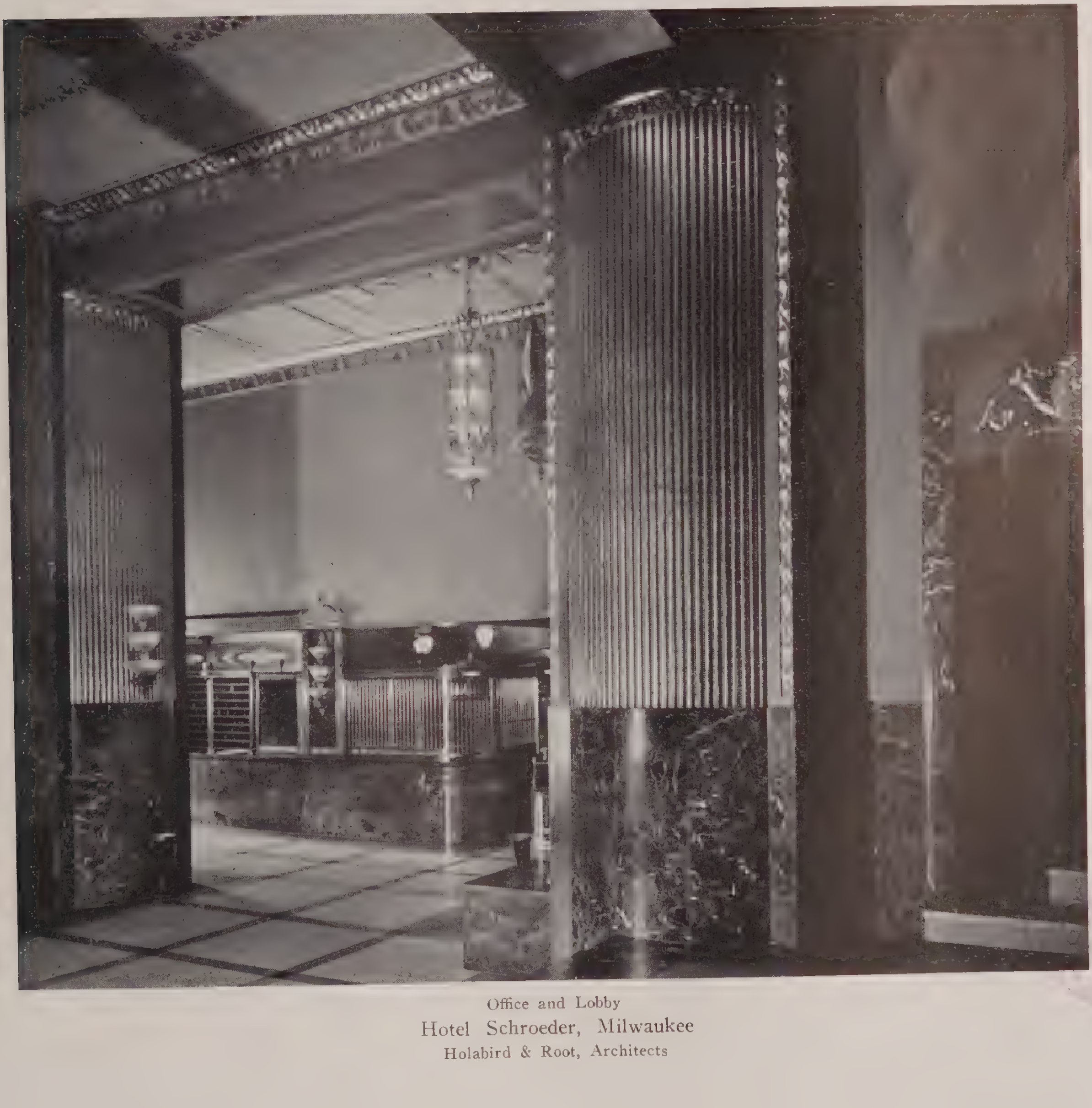


Detail of Ball Room
Hotel Schroeder, Milwaukee
Holabird & Root, Architects

were reproduced or adapted *ad lib.*, and they still are. While buggies became motor cars, sail boats steamships, balloons dirigibles, and kites airplanes, our decoration and furniture remained practically unchanged. Our interiors presented, and often still do present, an environment as unfitted to the fashions in dress of the day, as would be an armor-clad pilot in an airplane. With period styles forming the architectural alphabet, and mass production of period furniture and decorative material the vogue, an escape from this predicament seemed well nigh impossible. But the seeds of revolt against the old manner of doing things, against the persistent copying of old ideas, became apparent, and the l'art noveau movement, beginning about 1890-1900, grew into a movement which, for want of a better expression, is now called "Modern" or "Contemporary."

In its reversion to first principles, its desire to throw overboard the prevalent manner of doing things, the first effects were simple and crude, and with ragtime and jazz in music, cubistic creations in painting, free verse in poetry and the like, efforts in this direction were met with the ridicule that comes from lack of understanding and fear and dislike of what is not comprehended. With a growing understanding for the necessity of the correlation of all of the arts and endeavors that form the expression of the life of today, the idea of the "modern" movement, in decorations and furnishing becomes more clear. It is becoming realized that the structure and construction materials form the basis from which design is developed and that interior decoration is merely architectural development and completion.

The hotel makes its particular appeal through service and the provision of comfortable luxury for the leisure hours of life in compensation for



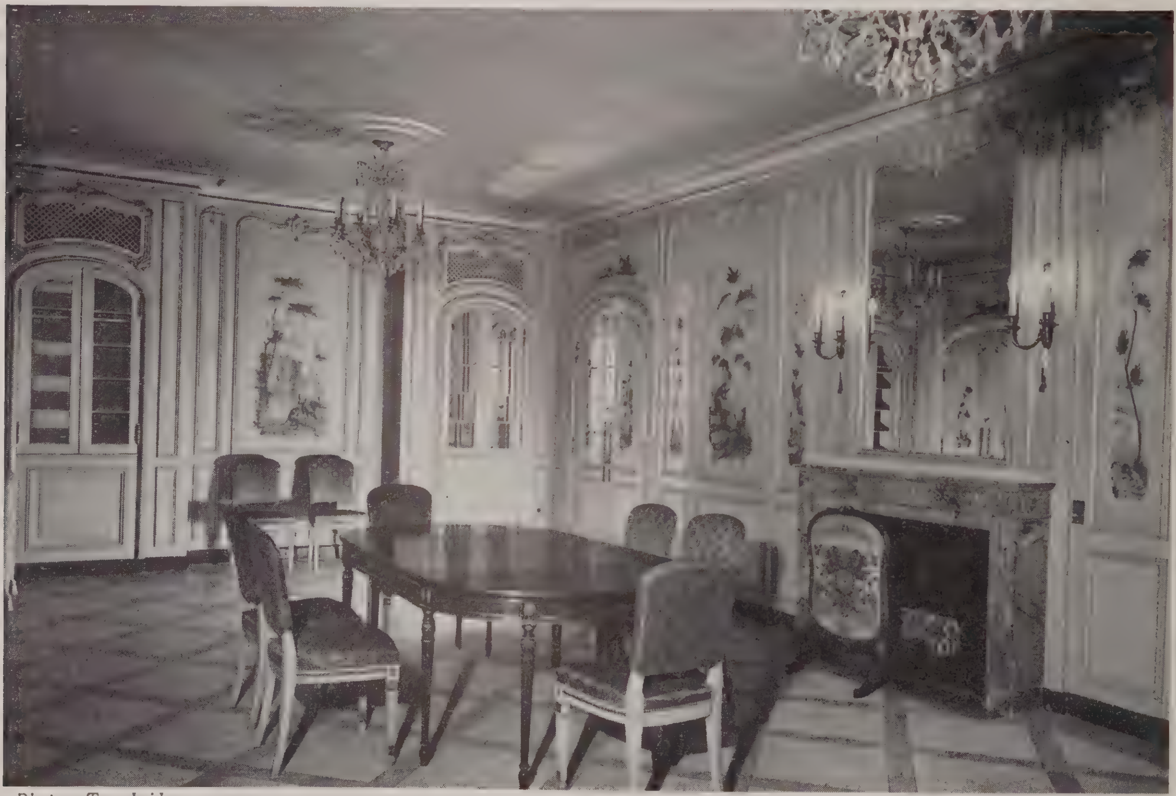
Office and Lobby
Hotel Schroeder, Milwaukee
Holabird & Root, Architects

the strain and complexity of our work-a-day lives. As people generally sought in the hotel something which their own homes lacked, it was rather natural that they should be impressed with the lavishly carved and embellished designs of the period styles, with the growing accumulation of objects of art, and an extravagance of decorative effect suggestive of commercial prosperity and advancement. But with the development of a more democratic taste the desire for regal expenditure and lavishness has diminished to a large extent in favor of simplicity and refinement.

The atmosphere of the period styles has given way to a studied attempt to express ourselves in our own way and to create a suitable setting for the life of our own time. The "modern" trend in design is toward simple severity, with the use of flat planes, light and shadow, of clean-cut angles and flutings and sharp color contrasts arranged with the same rhythm as modern dancing and music, and with the same simplicty and directness as the sweeping lines of our automobiles and airplanes. Careful selection, discrimination, and the elimination of non-essentials form the basis of modern decoration. Furniture is slowly conforming to the same idea and is being designed in harmony with the decorative scheme with strong lines, flat surfaces and a tendency toward affording ease as well as giving architectural effect.

As the design of furniture has always been governed by the prevailing styles in costumes, so our chairs and couches are built low and comfortable in keeping with the cross-kneed ease of modern dress. The invention of synthetic materials and of new methods for the use of old materials offers a wide selection of decorative aids, and these are invariably used in a manner to display their individual characteristics and their innate beauty. For the floors of large public rooms, lobbies, lounges and similar spaces, terrazzo is rapidly becoming the material most used, and it offers an extremely wide range of color and design. Of course, marble floors are still extensively laid, and rubber tile, cork tile and similar products are much used where found desirable. Wood parquet floors set in mastic directly upon the concrete slab are finding favor, while for bedrooms and their corridors, using carpet laid with cushioning above the concrete is common practice.

Walls are broadly handled, and when formality is desired marble may be found in large simple slabs displaying the beauty of the material, or use may be made of wainscoting, installed where the wood is alive with its natural color and beauty unspoiled by heavy staining. The economy and ease of the use of plaster have been followed by



Photos. Trowbridge

Private Dining Room
Palmer House, Chicago
Holabird & Root, Architects

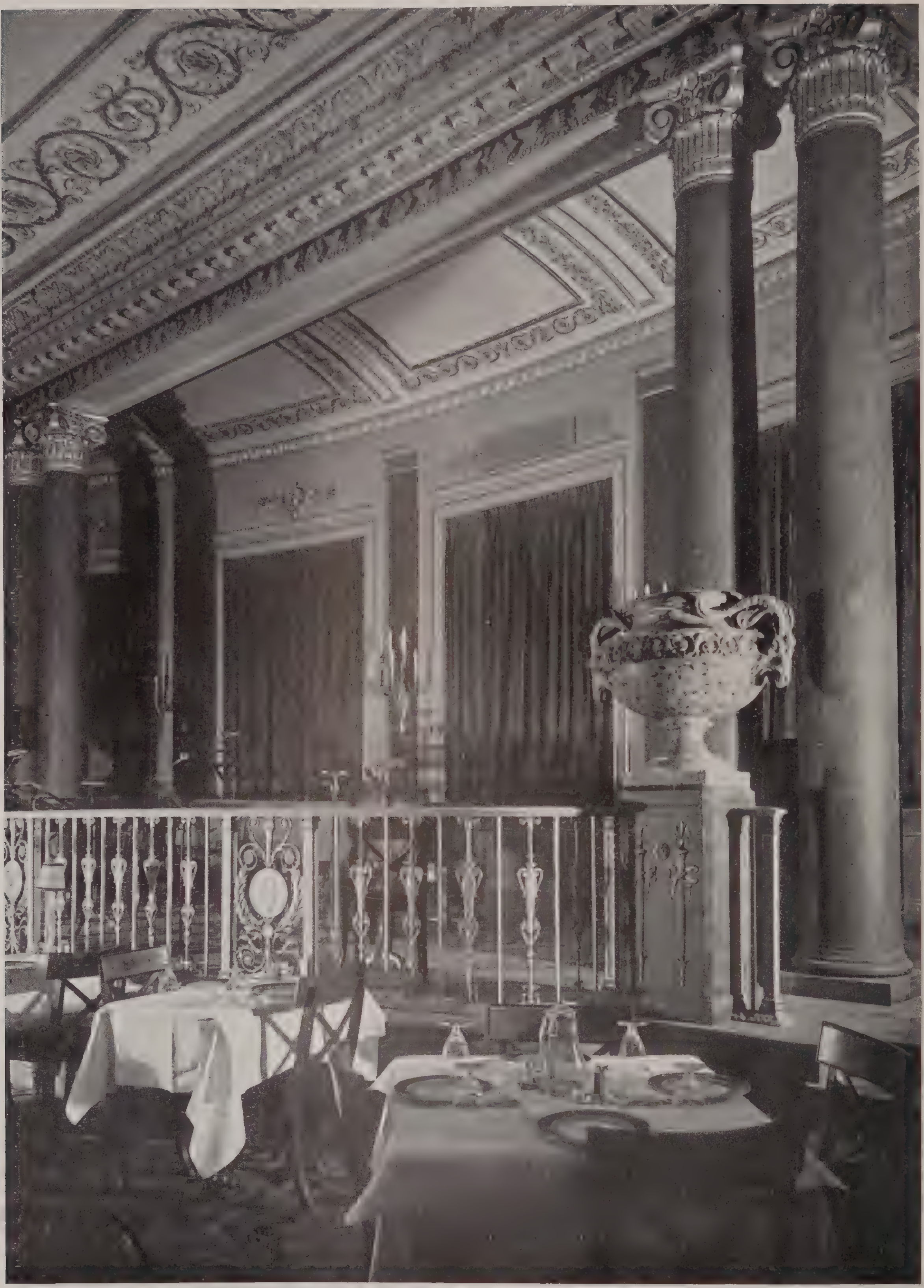
the extensive application of paint with its innumerable opportunities for gradation of tone and bright contrasts of color. For the bedrooms and their corridors, wallpapers offer a wide choice of color and design in the latest mode at a relatively low cost and with the possibility of obtaining variable effects. The supply of fabrics is unlimited as to design, material, weight and color, and in painted rooms the fabrics set the color scheme, since it is much easier for fabrics to be matched with paint than paint with fabrics. Fabrics are hung in long folds and unbroken lines with an entire absence of fussiness, and in a manner calculated to display the interest and charm of the material to the best advantage.

In the conception of decorative schemes, the tendency toward the use of cool colors persists, with shades of green and blue predominating, often lending apparent spaciousness to the areas so treated. With these combinations silver is used to an increasing extent, and nickel metal, with surfaces varying from the dull to a high gloss, lends grace and distinctiveness to grilles, railings and other features, whether used separately or in combination with metal having a black or other contrasting finish. The use of black as a background, particularly in smaller spaces, is becoming favored and affords opportunity for the use of strong, warm colors. The use of color is spreading throughout all sections of modern hotels and similar structures. White tile, long the sign and symbol of perfect sanitation, is being replaced with colored tile, colored glass, etc., with bath tubs, lavatories and other fixtures to match.

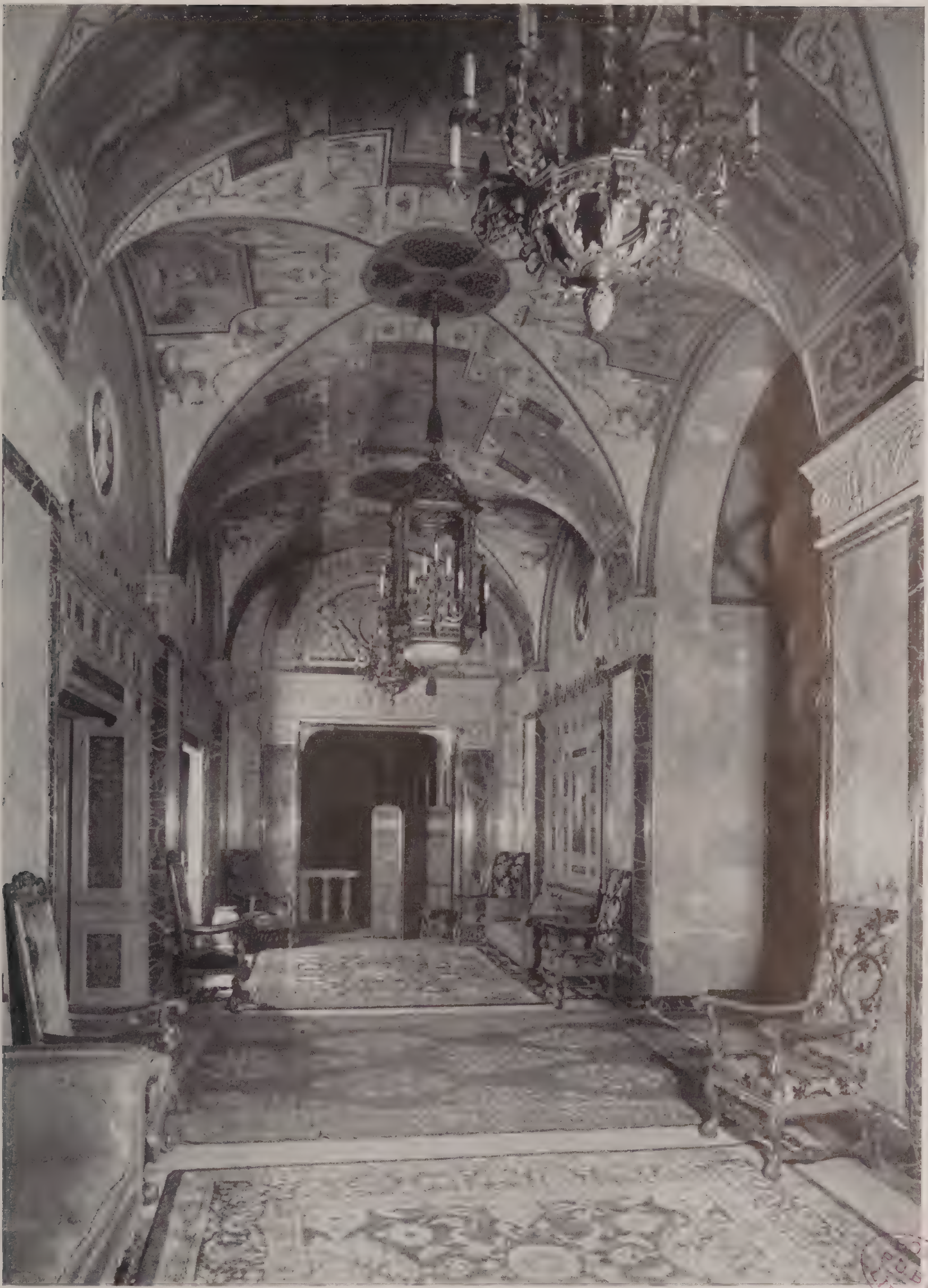
Of paramount importance in the modern decorative scheme is the extreme flexibility in illumination afforded by the universal use of electricity. Perhaps nothing will ever equal the charm and softness of candle light, and its influence for many years in the design of lighting fixtures is very apparent; but in the new scheme of things electricity is a source of illumination used entirely on its own merits and with almost unlimited scope in its application. In direct lighting, glass of extreme beauty and texture, or combinations of metal and glass, are arranged in fascinating forms of infinite variety and charm, and expressive only of light, while for indirect lighting, the flat reflective surfaces of modern decoration offer unending opportunities for obtaining varying effects.

Among modern structures the hotel offers perhaps the greatest field to the architect and decorator for their efforts to escape from the thraldom of the past, and it presents an opportunity for creating surroundings in harmony and sympathy with the varying ideas of a changing world.

Entrance Stairway
Palmer House, Chicago
Holabird & Root, Architects



MAIN DINING ROOM
PALMER HOUSE, CHICAGO
Holabird & Root, Architects



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DINING ROOM FOYER
SHERRY-NETHERLAND HOTEL, NEW YORK
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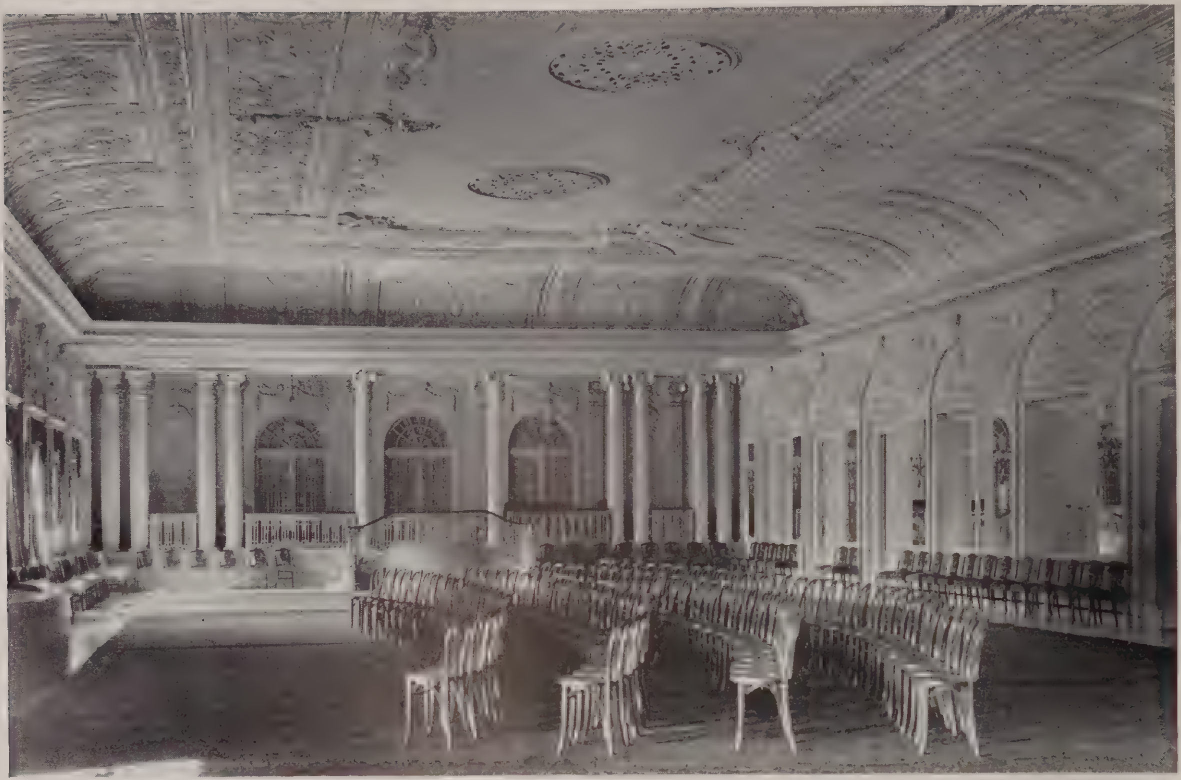
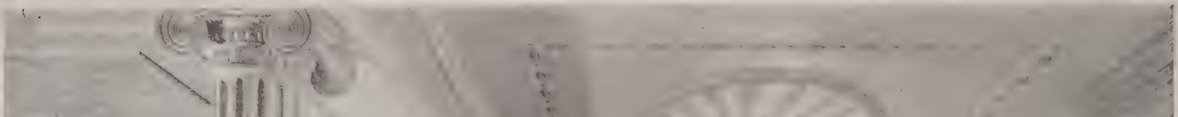


Photo. Tebbs & Knell, Inc.

BALL ROOM, HOTEL PEABODY, MEMPHIS

W. W. AHLSCHLAGER, ARCHITECT



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BALL ROOM, MOLLY PITCHER HOTEL, RED BANK, N. J.

NATHAN HARRIS AND HARRIS & SOHN, ARCHITECTS

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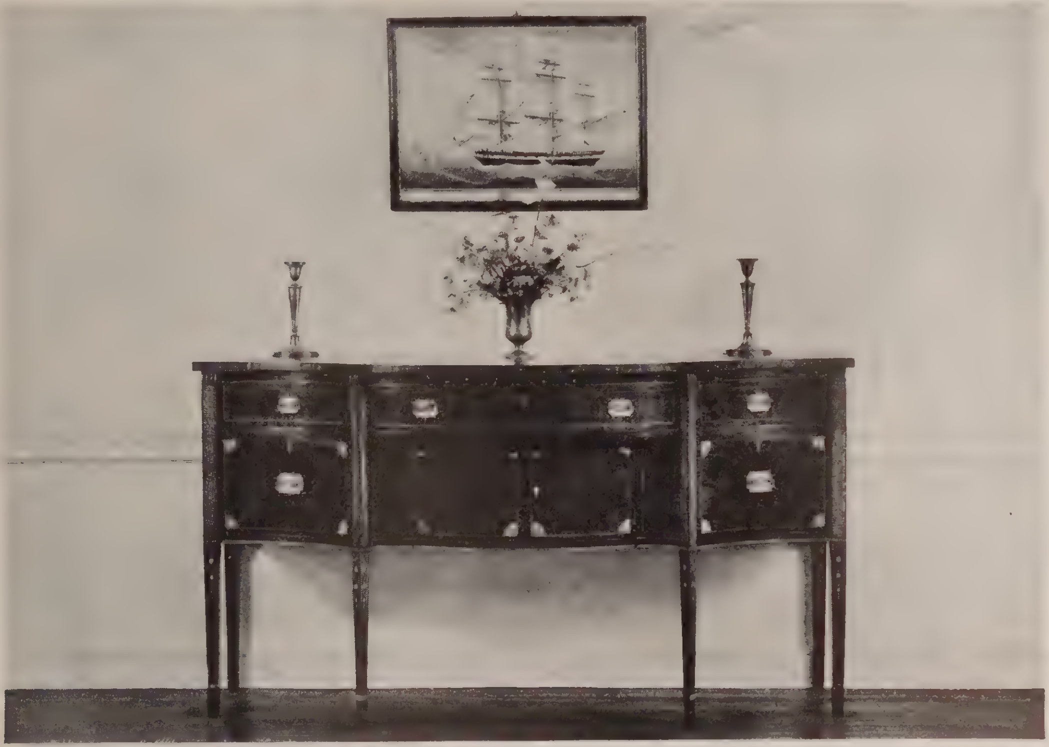

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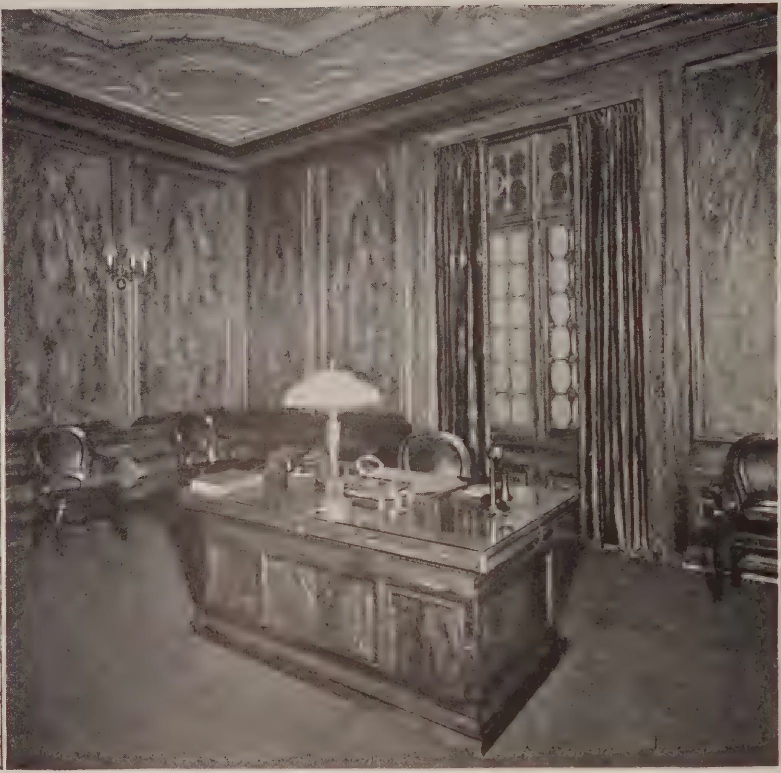

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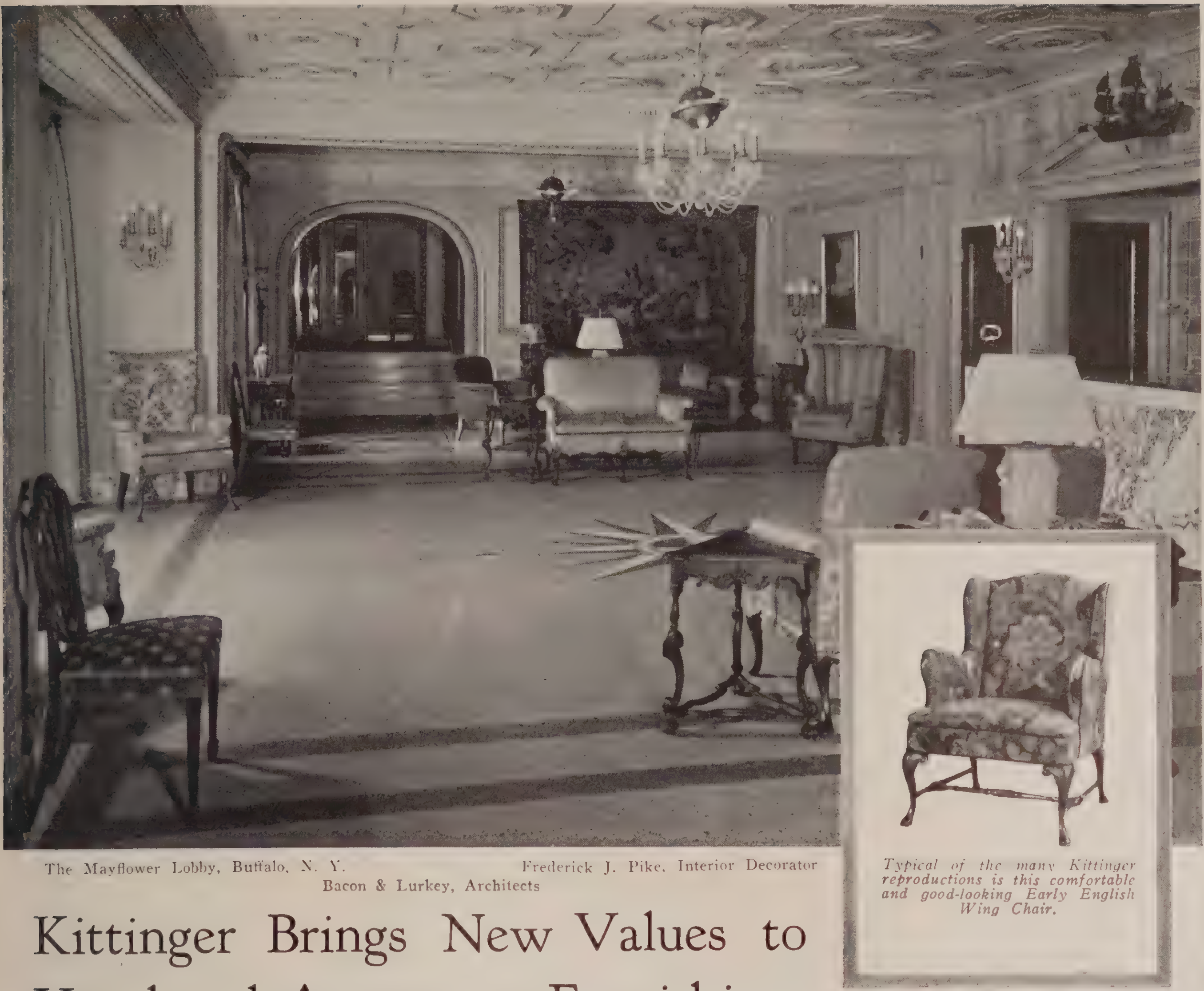

The Mayflower Lobby, Buffalo, N. Y. Frederick J. Pike, Interior Decorator
Bacon & Lurkey, Architects

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AUTHENTIC PLASTER ORNAMENT

McKIM, MEAD and WHITE, *Architects*

Pompeian Court

executed by Jacobson
in the Metropolitan Museum of Art, New York

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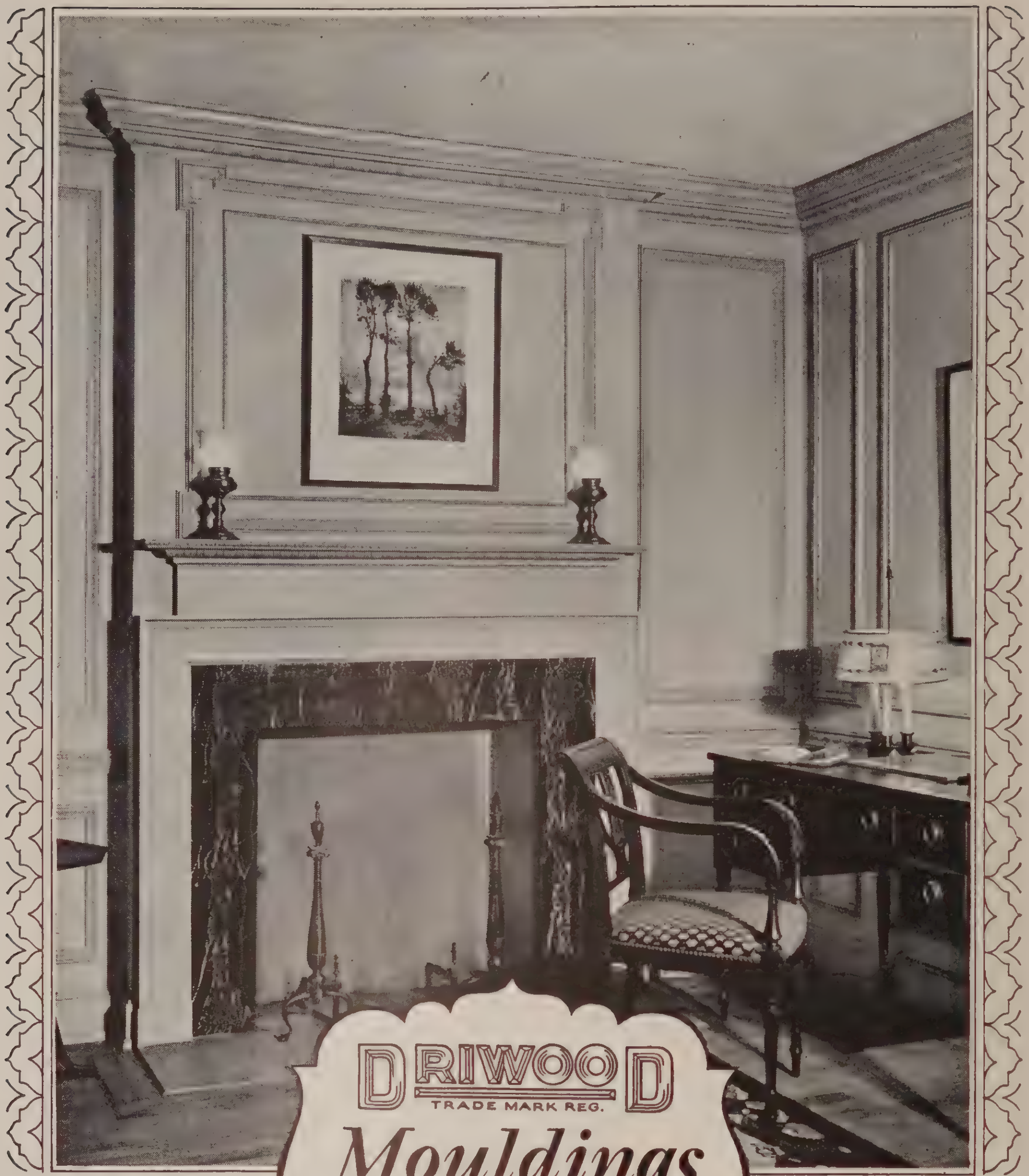

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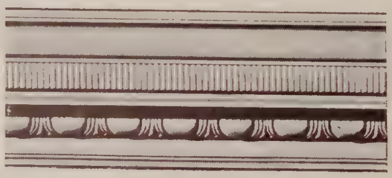
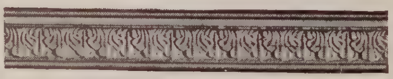
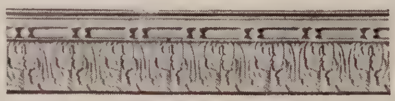


Ceiling Cornice Assembly CC-14



Panel Moulding No. 2052



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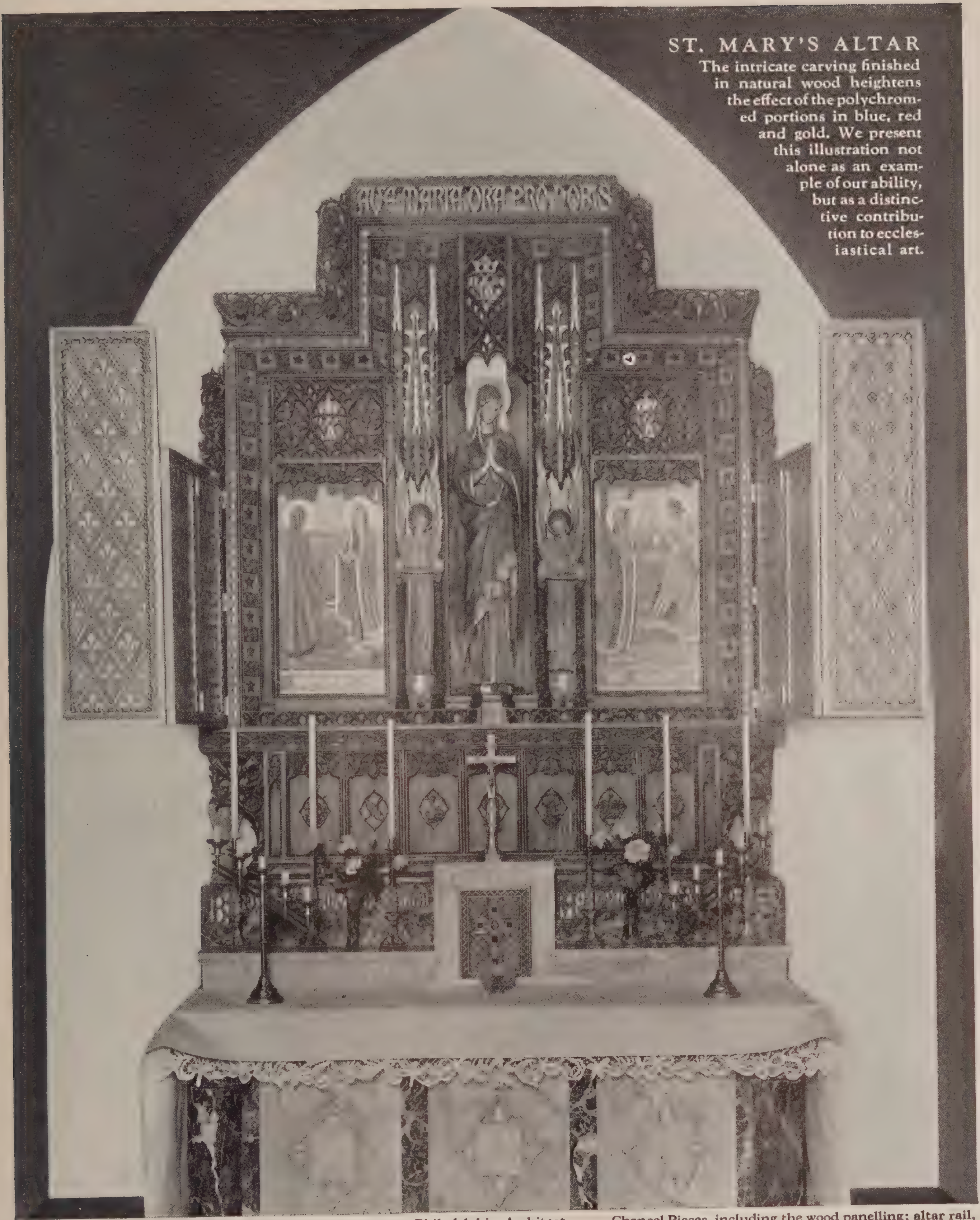

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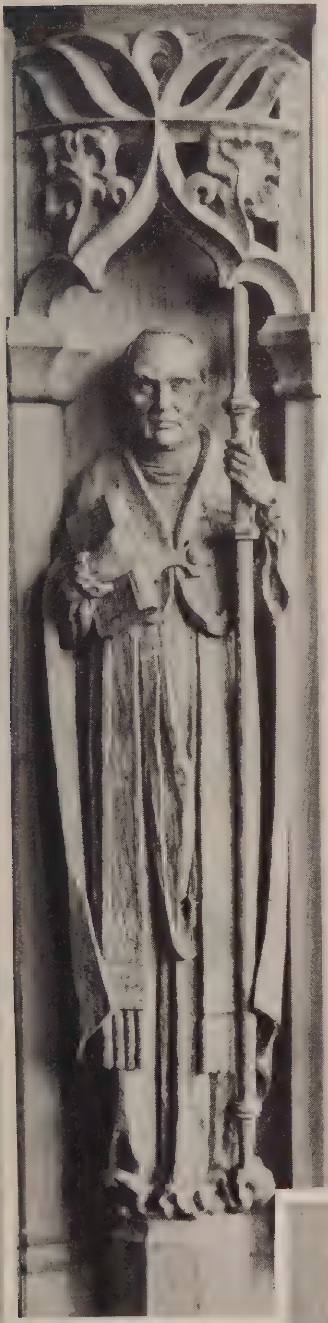
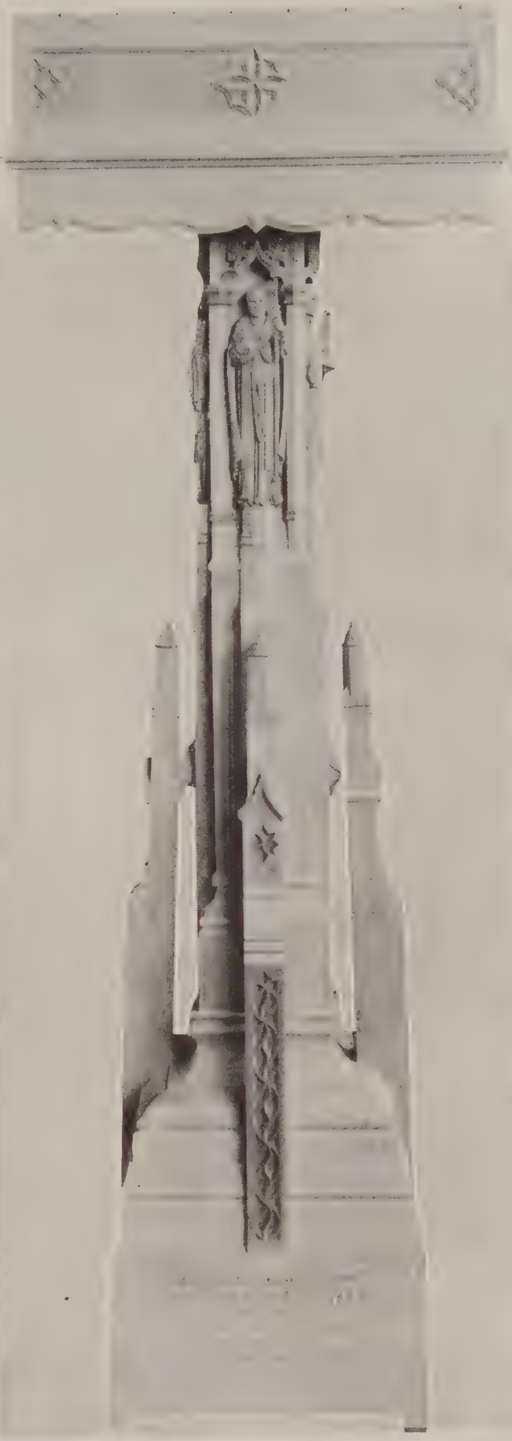
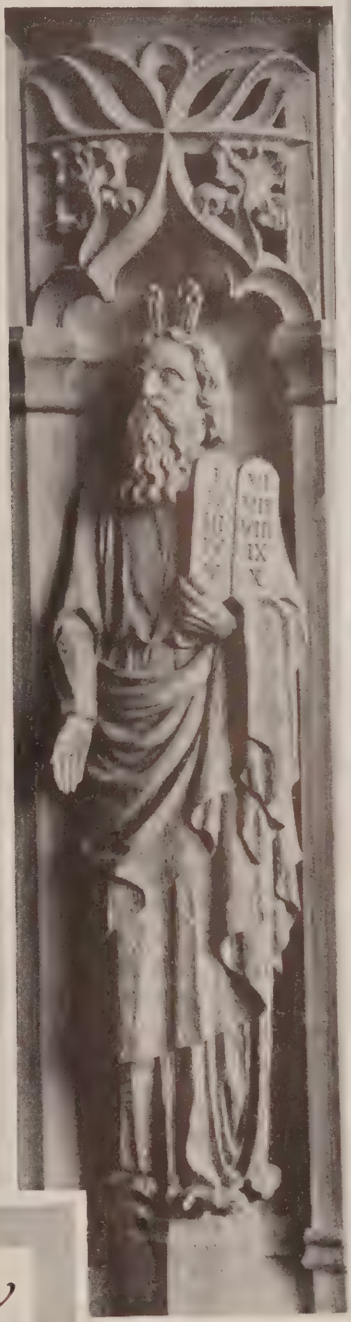


Enlarged detail of the
Statue of the
Rt. Rev. C. P. Anderson,
Bishop of Chicago,
one of the
figures on the pedestal





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Statue of Moses,
one of the figures on
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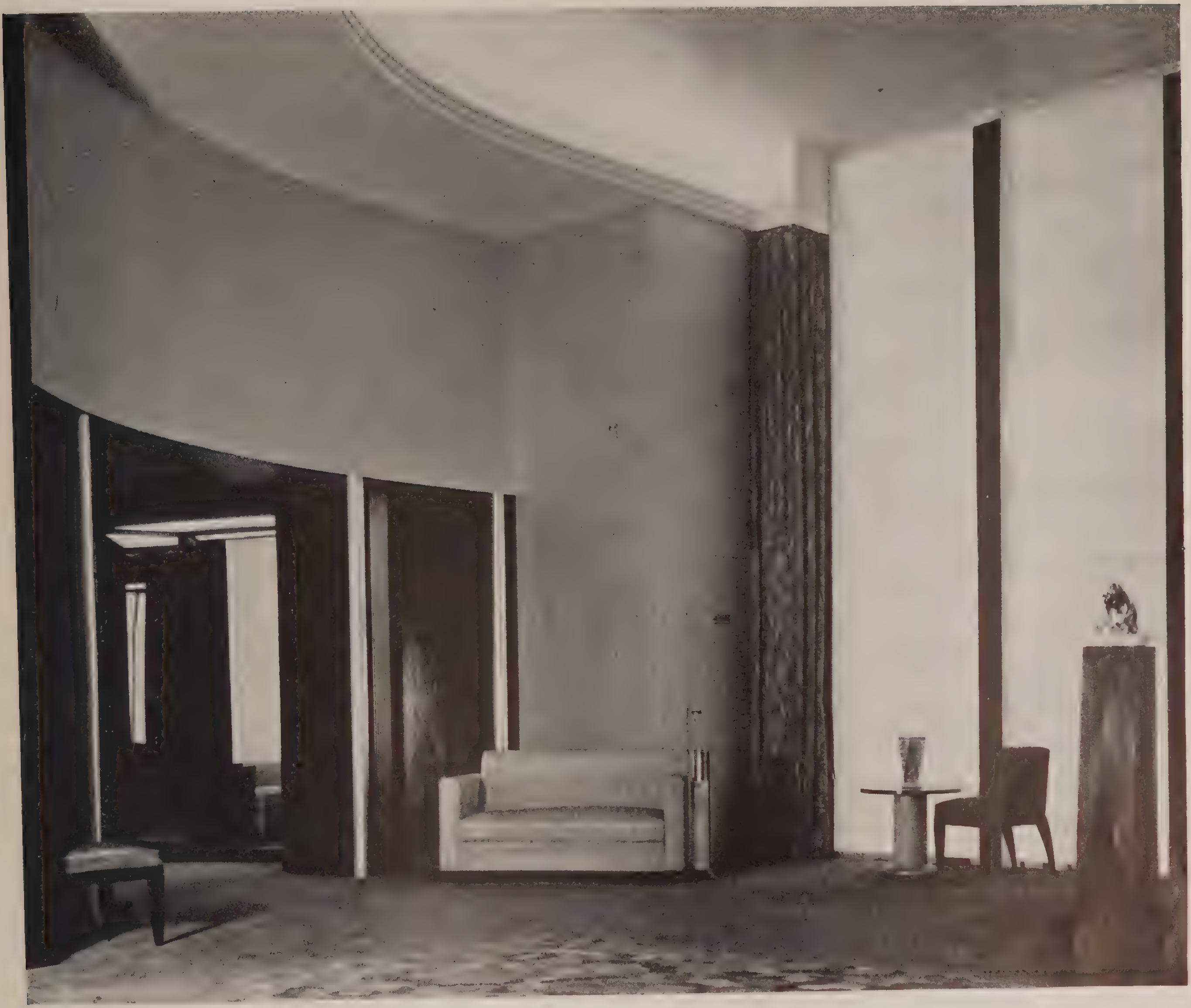

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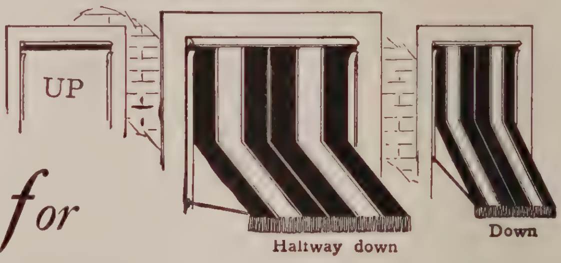

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Also see pages 127, 128 and 129 in the Engineering Section of this issue

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Left, Foyer of the Arcady Apartments, Los Angeles. Left, below, Lobby of the Bismarck Hotel, Chicago. Right, below, Main Dining Room, King Cotton Hotel, Greensboro, N. C.

These hotels are typical of the famous hotels throughout

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Right, Lounge of the Longwood Towers, Brookline, Mass. Right, below, Lobby of the Jefferson Davis Hotel, Montgomery, Ala. Left, below, Main Dining Room of the Warwick Hotel, New York.

the country furnished by Albert Pick-Barth Company, Inc.

A "Warwick" Door Bed in the Hotel Governor Clinton, New York. Note that the door is always closed behind.

"Warwick" Roller Beds in the Hotel Governor Clinton give guests added convenience in sample rooms.

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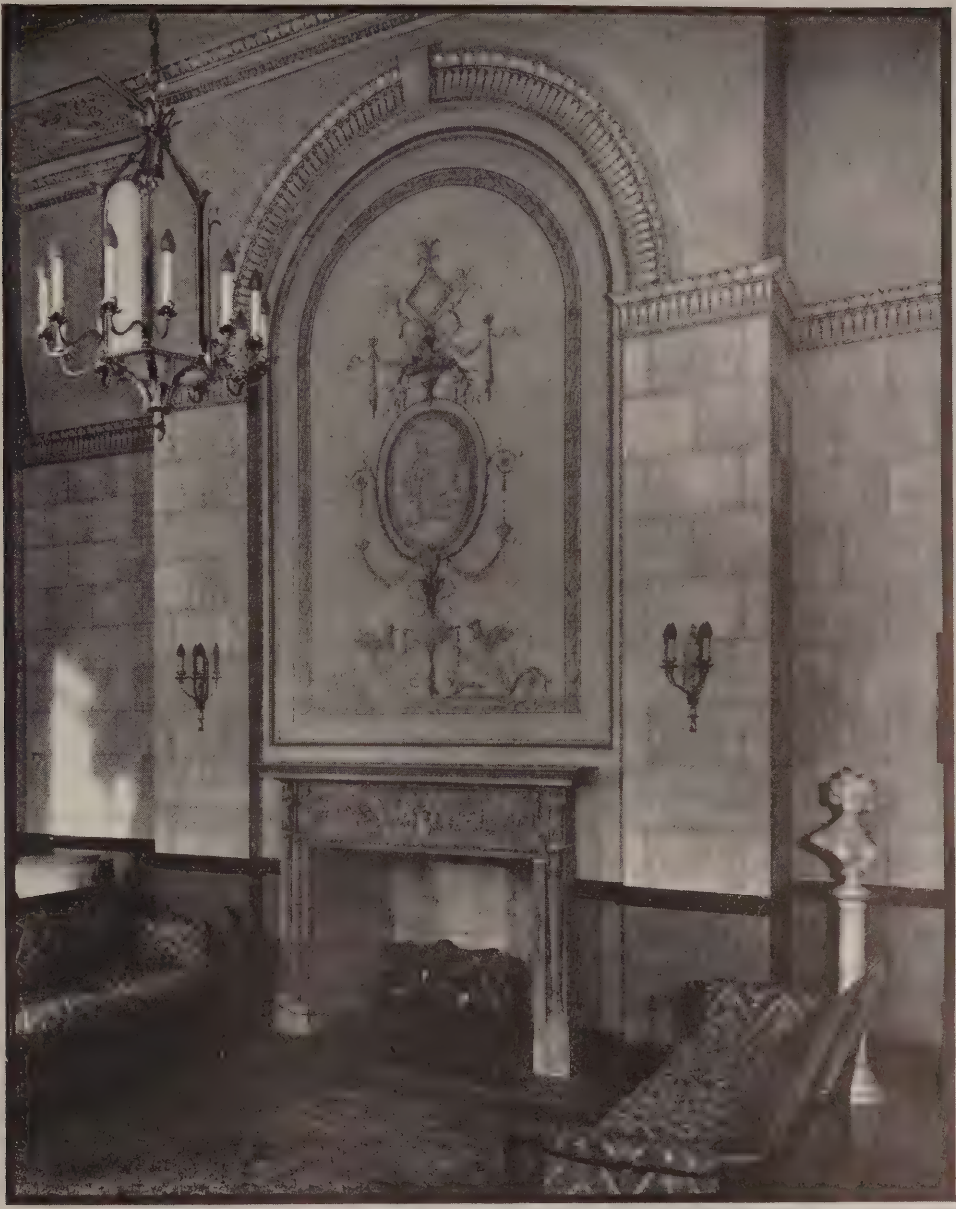

Zenitherm Wall in reception room, Stark County Tuberculosis Hospital, Louisville, Ohio. Albert L. Thayer, Architect

Zenitherm *keyed* this Reception room

TO plan a hospital reception room without the usual austere and forbidding atmosphere was architect Thayer's aim. He keyed this cheery, rest-inviting room by using Zenitherm in warm, golden tones on the walls, with a colorful panel over the fireplace. Zenitherm was delivered to the job already cut in blocks ⅝″ thick, and nailed to furring just like wood. Zenitherm is now made in a range of 21 colors. Glad to send you samples showing the variable texture and tri-toned effects.

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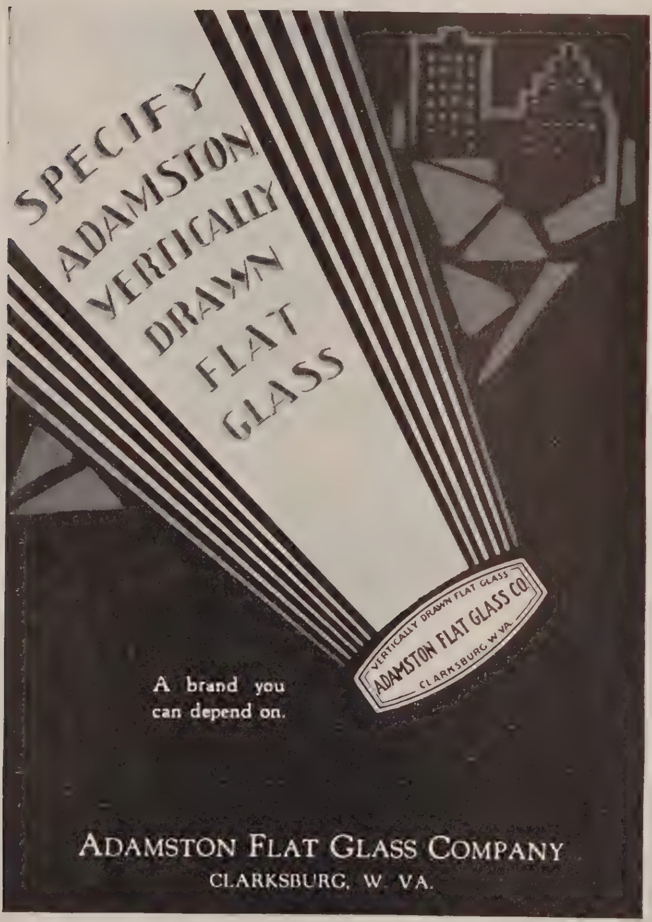

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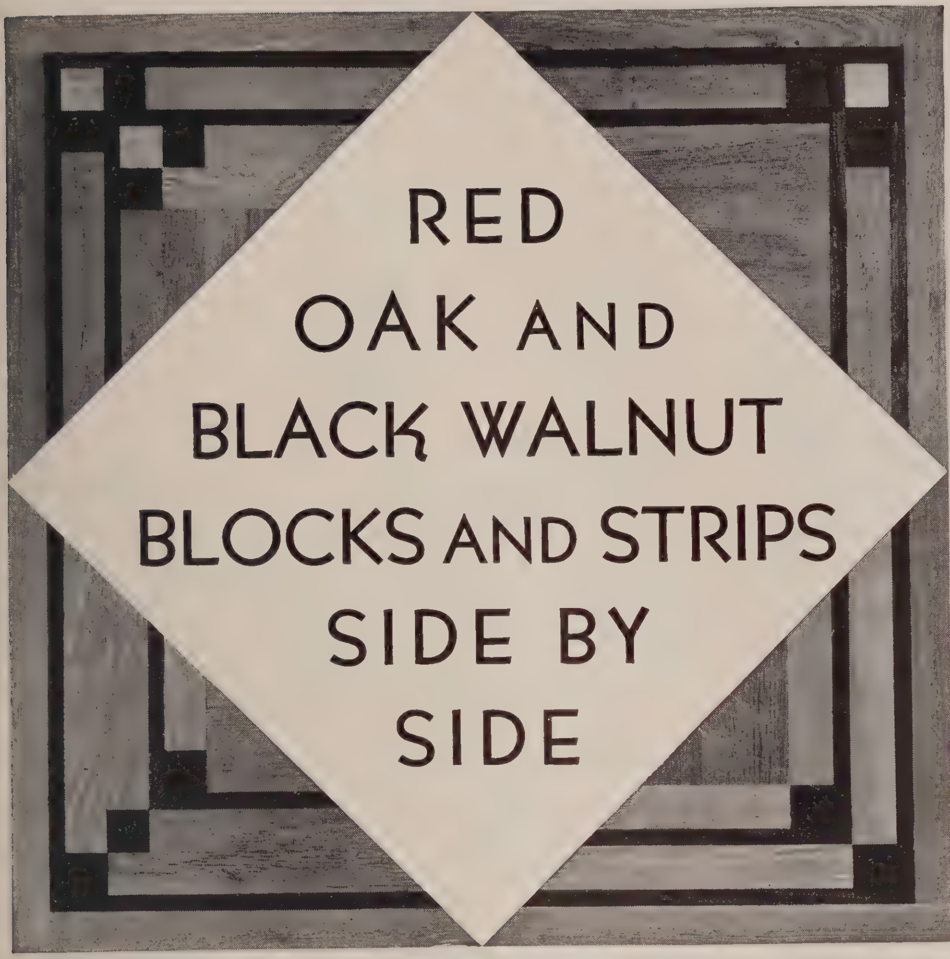

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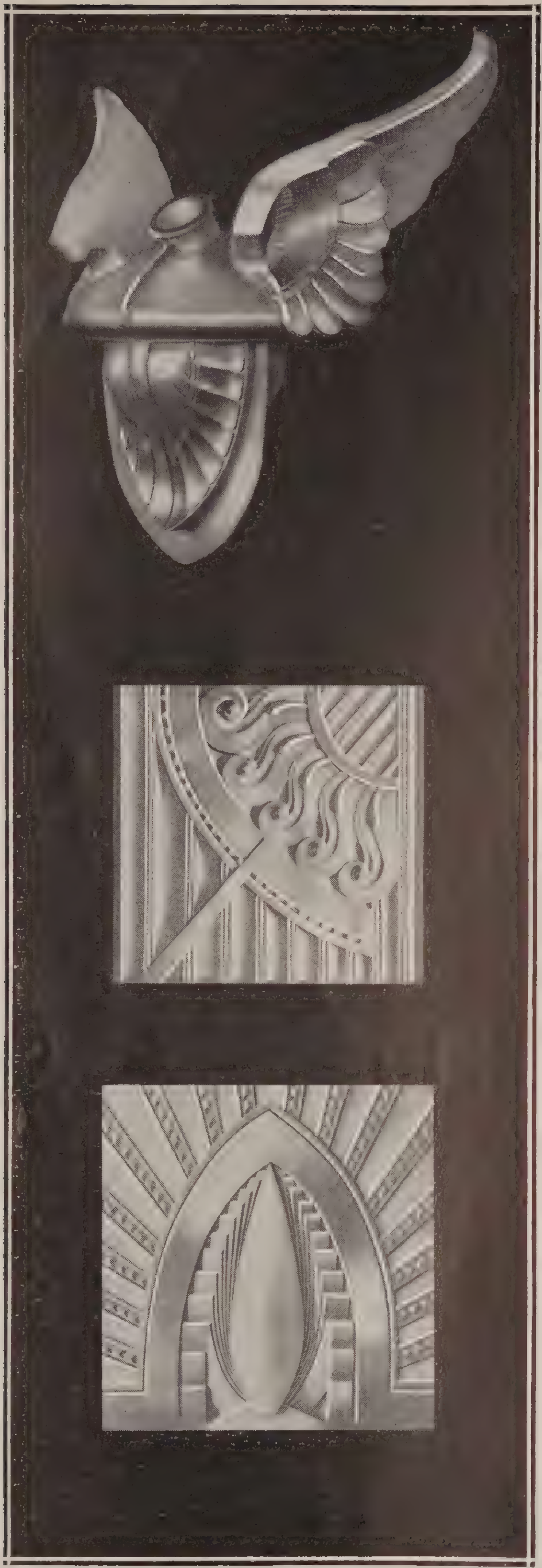

ALCOA

THE fabrications shown on this page—each of which is specified in the construction of the Chrysler Building—are excellent examples, both of the wide range offered by Aluminum in matters of ornamentation and design and of its usefulness as a building material metal.

A substantial saving in permanent upkeep is one very definite advantage. No painting is required to protect these castings from the action of the elements . . . for the material is non-corrodible and will last as long as the building on which it is placed. The permanency of the design detail is also assured, since the indented surfaces will not be filled and gradually obscured by coats of paint applied at intervals as a protective measure.

An added advantage is found in the fact that Aluminum will not develop rust, and hence will not streak and stain the adjacent surfaces.

A booklet, "Architectural Aluminum," describes and visualizes many interesting uses of Aluminum in the architectural field. May we send you a copy?

Aluminum Company of America
24993 Oliver Bldg., Pittsburgh, Pa.
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[Design drawings and further details of the flagpole holder and spandrels used on the Chrysler Building will be found on the following page.]

ARCHITECTURAL ALUMINUM

ALCOA

BOTH the decorative and the practical qualities inherent in Aluminum have been recognized and taken advantage of in an interesting way by Wm. Van Alen, architect for the Chrysler Building—now in process of construction.

One hundred and eighty-five ornamental Aluminum Spandrels of three different patterns are placed between the upper and lower tiers of windows from the 21st to 24th floors.

The set-back floors—the 24th, 27th and 31st—will also be furnished with Aluminum backed copings, Aluminum handrails, and handrail supports.

A large cast Aluminum flagpole holder symbolizing the winged cap on the Chrysler car will be placed above the main entrance on the fifth floor level, and from between its wings will arise a flagpole.

An architectural rendering of the Chrysler Building is shown at the right, and close up pictures of some of the Aluminum fabrications used in its construction will be found on the opposite page.

The Aluminum Alloy was created and fabricated by

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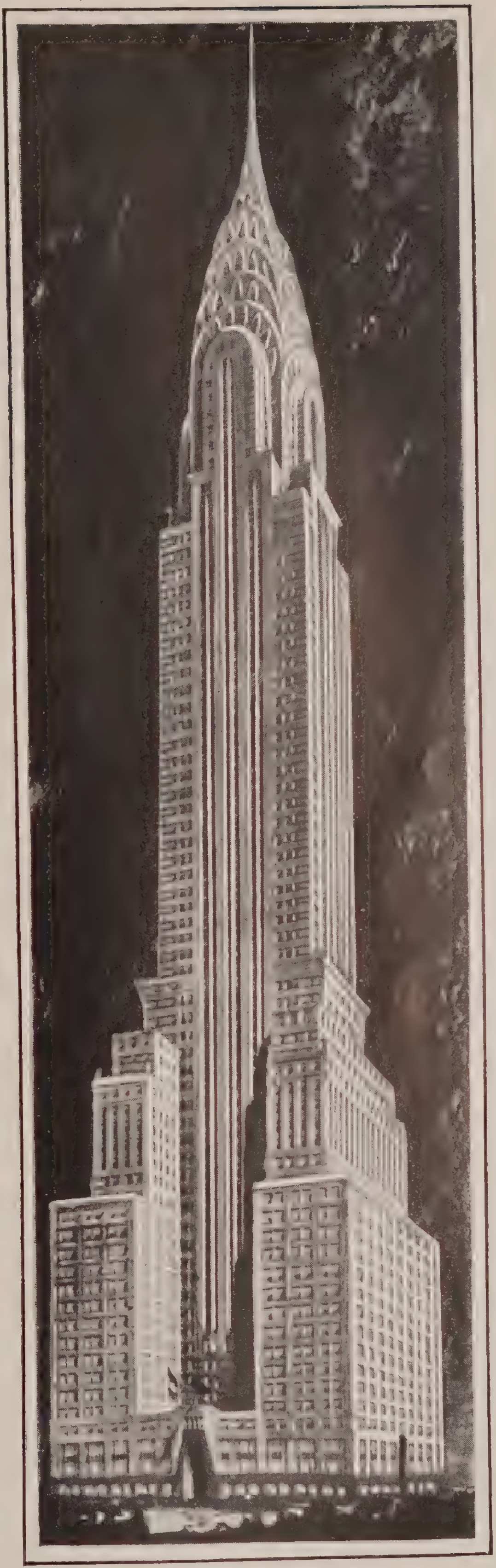
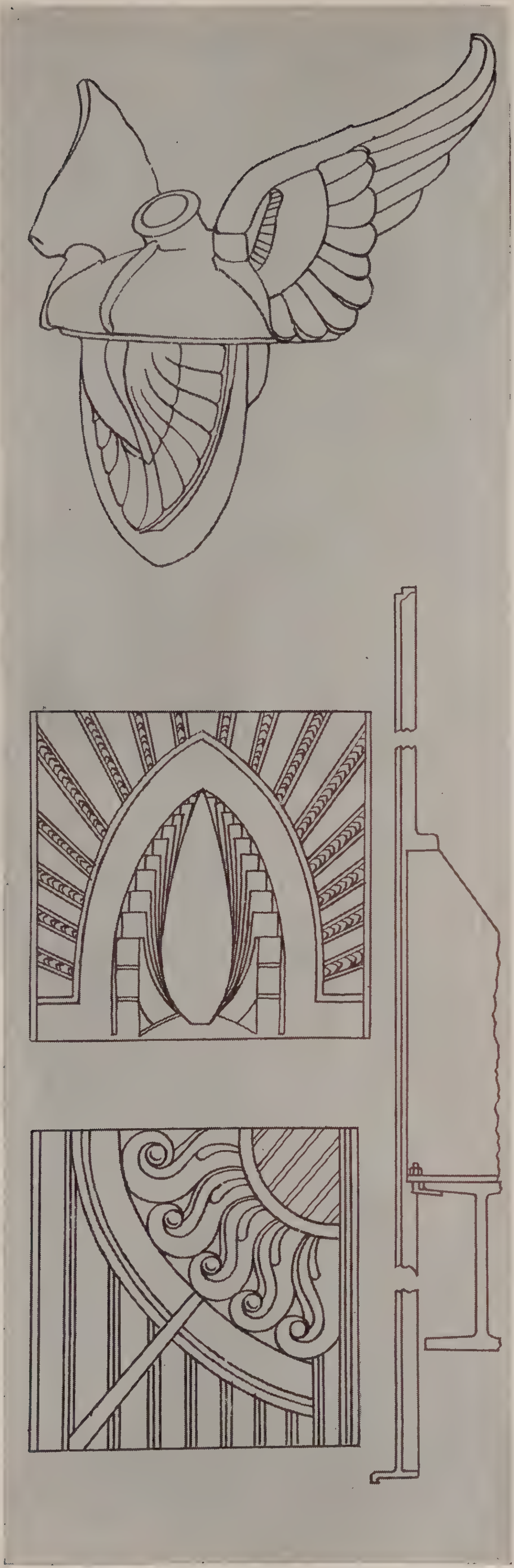


ARCHITECTURAL ALUMINUM



[*This flagpole holder and the spandrels are described on the two preceeding pages of this issue*]

ALCOA

THE winged holder, containing a flagpole socket, shown at the upper left in simple outline detail is 7' 9" wide, 7' 9" long, and 4' 10" high from base of wing to tip. It is finished in the natural metal and highly polished.

The two decorative spandrels shown just beneath (with working detail) are approximately 4' 10" square with a wall thickness of ¼". They are sand cast, sand blasted and high lighted.

All of these fabrications (including the cast window sills) are made of No. 43 alloy, having a silicon content of 5%. The weight does not exceed .097 pounds per cubic inch and the average tensile strength is not less than 17,000 lbs. per square inch.

This material is very workable. It is light, durable, strong and non-corrodible, and its silvery gray color blends beautifully with almost every decorative scheme.

We will be glad to furnish further details concerning any of the fabrications described here.

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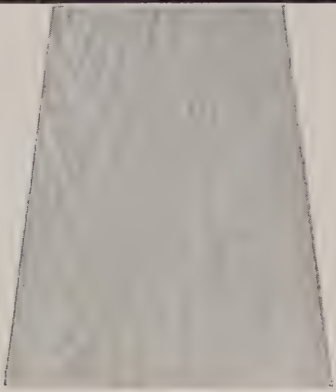

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A Duraflex Tile installation in the Liverpool High School, Liverpool, N. Y. Earl Hallenbeck, Architect, Syracuse, N. Y.

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FOR THE SERVICE OF ARCHITECTS, ENGINEERS, DECORATORS, AND CONTRACTORS

The publications listed in these columns are the most important of those issued by leading manufacturers identified with the building industry. They may be had without charge unless otherwise noted, by applying on your business stationery to *The Architectural Forum,* 521 Fifth Ave., New York, or the manufacturer direct, in which case kindly mention this publication.

ACOUSTICS

R. Guastavino Co., 40 Court St., Boston.
Akoustolith Plaster. Brochure, 6 pp., 8½ x 11 ins. Important data on a valuable material.

Johns-Manville Corporation, New York.
Sound-Absorbing Treatment in Banks and Offices, Booklet, 18 pp., 8½ x 11 ins. Illustrated.
Sound-Absorbing Treatment in Churches and Religious Institutions. Brochure. 22 pp., 8½ x 11 ins. Illustrated.

U. S. Gypsum Co., 205 W. Monroe St., Chicago, Ill.
A Scientific Solution of an Old Architectural Problem. Folder, 6 pp., 8½ x 11 ins. Describes Sabinite Acoustical Plaster.

ASH HOISTS

Gillis & Geoghegan, Inc., 544 West Broadway, New York.
G & G Telescopic Hoist catalog, 8½ x 11, A.I.A. Standard Classification 30i1 contains complete descriptions, method of selecting correct model to fit the building's needs, scaled drawings showing space requirements and specifications.

ASH HOISTS—TELESCOPIC

Gillis & Geoghegan, Inc., 544 West Broadway, New York.
G & G Telescopic Hoist catalog, 8½ x 11, A.I.A. Standard Classification 30i1 contains complete descriptions, method of selecting correct model to fit the building's needs, scaled drawings showing space requirements and specifications.

BRICK

American Face Brick Association, 1751 Peoples Life Building, Chicago, Ill.
Brickwork in Italy. 298 pp., size 7½ x 10½ ins., an attractive and useful volume on the history and use of brick in Italy from ancient to modern times, profusely illustrated with 69 line drawings, 300 half-tones, and 20 colored plates, with a map of modern and XII century Italy. Bound in linen. Price now $3.00, postpaid (formerly $6.00). Half Morocco, $7.00.
Industrial Buildings and Housing. Bound Volume, 112 pp., 8½ x 11 ins. Profusely illustrated. Deals with the planning of factories and employes' housing in detail. Suggestions are given for interior arrangements, including restaurants and rest rooms. Price now $1.00 postpaid (formerly $2.00).

Hanley Company, Bradford, Pa.
General Catalog. 16 pp. 8½ x 11 ins. Illustrated.
Bradford Reds. Folder. 8 pp., 3 x 8 ins. Illustrated.

CABINET WORK

Henry Klein & Co., 25 Grand Street, Elmhurst, L. I., N. Y.
Driwood Period Mouldings in Ornamented Wood. Brochure, 28 pp., 8½ x 11 ins. Illustrated.
Ensemble Offices for the Banker and Broker. Folder. 4 pp., 8½ x 11 ins. Illustrated.
Luxurious Office Partitions in Walnut, Mahogany and Quartered Oak. Folder. 4 pp., 8½ x 11 ins. Illustrated.

CEMENT

Carney Company, The, Mankato, Minn.
A Remarkable Combination of Quality and Economy. Booklet, 20 pp., 8½ x 11 ins. Illustrated. Important data on valuable material.

Kosmos Portland Cement Company, Louisville, Ky.
Kosmortar for Enduring Masonry. Folder, 6 pp., 3½ x 6½ ins. Data on strength and working qualities of Kosmortar.
Kosmortar, the Mortar for Cold Weather. Folder, 4 pp., 3⅜ x 6½ ins. Tells why Kosmortar should be used in cold weather.

Louisville Cement Co., 315 Guthrie St., Louisville, Ky.
BRIXMENT for Perfect Mortar. Self-filing handbook, 8½ x 11 ins. 16 pp. Illustrated. Contains complete technical description of BRIXMENT for brick, tile and stone masonry, specifications, data and tests.

Portland Cement Association, Chicago, Ill.
Concrete Masonry Construction. Booklet, 48 pp., 8½ x 11 ins. Illustrated. Deals with various forms of construction.
Town and Country Houses of Concrete Masonry. Booklet, 20 pp., 8½ x 11 ins. Illustrated.
Facts About Concrete Building Tile. Brochure, 16 pp., 8½ x 11 ins. Illustrated.
The Key to Firesafe Homes. Booklet, 20 pp., 8½ x 11 ins. Illustrated.
Design and Control of Concrete Mixers. Brochure, 32 pp., 8½ x 11 ins. Illustrated.
Portland Cement Stucco. Booklet, 64 pp., 8½ x 11 ins. Illustrated.

CEMENT—Continued

Concrete in Architecture. Bound Volume, 60 pp., 8½ x 11 ins. Illustrated. An excellent work, giving views of exteriors and interiors.

CHURCH EQUIPMENT

John Van Range Co., Cincinnati.
Practical Planning for Church Food Service. Booklet, 32 pp., 8½ x 11 ins. Illustrated.

CONCRETE BUILDING MATERIALS

Concrete Steel Company, 42 Broadway, New York.
Modern Concrete Reinforcement. Booklet, 32 pp., 8½ x 11 ins. Illustrated.

Kosmos Portland Cement Company, Louisville, Ky.
High Early Strength Concrete, Using Standard Kosmos Portland Cement. Folder, 1 page, 8½ x 11 ins. Complete data on securing high strength concrete in short time.

CONCRETE COLORINGS

The Master Builders Co., 7016 Euclid Ave., Cleveland.
Color Mix, Colored Hardened Concrete Floors (integral). Brochure, 16 pp., 8½ x 11 ins. Illustrated. Data on coloring for floors.
Dychrome. Concrete Surface Hardener in Colors. Folder, 4 pp., 8 x 11 ins. Illustrated. Data on a new treatment.

CONSTRUCTION, FIREPROOF

Master Builders Co., Cleveland, Ohio.
Color Mix. Booklet, 18 pp., 8½ x 11 ins. Illustrated. Valuable data on concrete hardener, waterproofer and dustproofer in permanent colors.

National Fire Proofing Co., 250 Federal St., Pittsburgh, Pa.
Standard Fire Proofing Bulletin 171. 8½ x 11 ins., 32 pp. Illustrated. A treatise on fireproof floor construction.

North Western Expanded Metal Co., 1234 Old Colony Building, Chicago, Ill.
North Western Expanded Metal Products. Booklet, 8½ x 10¾ ins. 16 pp. Fully illustrated, and describes different products of this company, such as Kno-burn metal lath, 20th Century Corrugated, Plaster-Sava and Longspan lath channels, etc.
A. I. A. Sample Book. Bound volume, 8½ x 11 ins., contains actual samples of several materials and complete data regarding their use.

CONSTRUCTION, STONE AND TERRA COTTA

Cowing Pressure Relieving Joint Company, 100 North Wells St., Chicago, Ill.
Pressure Relieving Joint for Buildings of Stone, Terra Cotta or Marble. Booklet, 16 pp., 8½ x 11 ins. Illustrated. Deals with preventing cracks, spalls and breaks.

DAMPPROOFING

The Master Builders Co., 7016 Euclid Ave., Cleveland.
Waterproofing and Dampproofing Specification Manual. Booklet, 18 pp., 8½ x 11 ins. Deals with methods and materials used.
Waterproofing and Dampproofing. File. 36 pp. Complete descriptions and detailed specifications for materials used in building and concrete.

Minwax Company, Inc., 11 West 42nd St., New York.
Complete Index of all Minwax Products. Folder, 6 pp., 8½ x 11 ins. Illustrated. Complete description and detailed specifications.

Sonneborn Sons, Inc., L., 116 Fifth Ave., New York.
Specification Sheet, 8½ x 11 ins. Descriptions and specifications of compounds for dampproofing interior and exterior surfaces.

Toch Brothers, New York, Chicago, Los Angeles.
Handbook of R. I. W. Protective Products. Booklet, 40 pp., 4½ x 7½ ins.

DOORS

David Lupton's Sons Company, Philadelphia.
Lupton Commercial Steel Doors. Folder. 8½ x 11 ins. Illustrated.
Lupton Steel Industrial Doors. Brochure. 8 pp., 8½ x 11 ins. Illustrated. Details and specifications.

DOORS AND TRIM, METAL

The American Brass Company, Waterbury, Conn.
Anaconda Architectural Bronze Extruded Shapes. Brochure, 180 pp., 8½ x 11 ins., illustrating and describing more than 2,000 standard bronze shapes of cornices, jamb casings, mouldings, etc.

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SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 73*

DOORS AND TRIM, METAL—Continued

The Kawneer Company, Niles, Michigan.
Detail sheet, 8½ x 11 ins., with A.I.A. File No. featuring Heavy Welded Bronze Doors.

Richards-Wilcox Mfg. Co., Aurora, Ill.
Fire-Doors and Hardware. Booklet, 8½ x 11 ins., 64 pp. Illustrated. Describes entire line of tin-clad and corrugated fire doors, complete with automatic closers, track hangers and all the latest equipment—all approved and labeled by Underwriters' Laboratories.

Truscon Steel Company, Youngstown, Ohio.
Copper Alloy Steel Doors. Catalog 110. Booklet, 48 pp., 8½ x 11 ins. Illustrated.

DOORS, SOUNDPROOF

Irving Hamlin, Evanston, Ill.
The Evanston Soundproof Door. Folder, 8 pp., 8½ x 11 ins. Illustrated. Deals with a valuable type of door.

DRAINAGE FITTINGS

Josam Mfg. Co., Michigan City, Ind.
Josam Products. Booklet, 73 pp., 8½ x 11 ins. Illustrated. A valuable line of accessories.
Josam-Marsh Grease, Plaster, Sediment and Hair Interceptors. Brochure. 7 pp., 8½ x 11 ins. Illustrated.
Josam New Saw Tooth-Roof Drain. Folder, 4 pp., 8½ x 11 ins. Illustrated.

DUMBWAITERS

Sedgwick Machine Works, 151 West 15th St., New York, N. Y.
Catalog and Service Sheets. Standard specifications, plans and prices for various types, etc. 4¼ x 8¼ ins., 60 pp. Illustrated.
Catalog and pamphlets, 8½ x 11 ins. Illustrated. Valuable data on dumbwaiters.

ELECTRICAL EQUIPMENT

Bryant Electric Company, Bridgeport, Conn.
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KeNeX Plug and Receptacle. Folder, 6 pp., 3½ x 6¼ ins. Illustrated.
Three-wire Polarized Caps and Receptacles. Leaflet, 8½ x 10 ins. Illustrated.
Three-wire Polarized Caps and Receptacles for Heavy Duty. Leaflet, 8½ x 10 ins. Illustrated.

General Electric Co., Merchandise Dept., Bridgeport, Conn.
Wiring System Specification Data for Apartment Houses and Apartment Hotels. Booklet, 20 pp., 8 x 10 ins. Illustrated.
Electrical Specification Data for Architects. Brochure, 36 pp., 8 x 10½ ins. Illustrated. Data regarding G. E. wiring materials and their use.
The House of a Hundred Comforts. Booklet, 40 pp., 8 x 10½ ins. Illustrated. Dwells on importance of adequate wiring.

Harvey Hubbell, Inc., Bridgeport, Conn.
Electrical Specialties. Catalog No. 19. 52 pp., 8½ x 10 ins. Illustrated.

Pick-Barth Company, Inc., Albert, 1200 West 35th St., Chicago, and Cooper Square, New York.
School Cafeteria. Booklet, 6 x 9 ins. Illustrated. The design and equipment of school cafeterias with photographs of installation and plans for standardized outfits.

Prometheus Electric Corporation, 360 West 13th St., New York.
Electric Heating Specialties. Booklet, 24 pages. 8½ x 11 ins. Illustrated. Specialties for heating, cooking, hospitals, organ lofts, etc.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Electric Power for Buildings. Brochure, 14 pp., 8½ x 11 ins. Illustrated. A publication important to architects and engineers.
Variable-Voltage Central Systems as Applied to Electric Elevators. Booklet, 12 pp., 8½ x 11 ins. Illustrated. Deals with an important detail of elevator mechanism.
Modern Electrical Equipment for Buildings. Booklet, 8½ x 11 ins. Illustrated. Lists many useful appliances.
Electrical Equipment for Heating and Ventilating Systems. Booklet, 24 pp., 8½ x 11 ins. Illustrated. This is "Motor Application Circular 7379."
Westinghouse Panelboards. Catalog 224. Booklet, 64 pp., 8½ x 11 ins. Illustrated.
Beauty; Power; Silence; Westinghouse Fans. (Dealer Catalog 45.) Brochure, 16 pp., 8½ x 11 ins. Illustrated. Valuable information on fans and their uses.
Electric Range Book for Architects (A. I. A. Standard Classification 31 G-4). Booklet, 24 pp., 8½ x 11 ins. Illustrated. Cooking apparatus for buildings of various types.
Westinghouse Commercial Cooking Equipment (Catalog 280). Booklet, 32 pp., 8½ x 11 ins. Illustrated. Equipment for cooking on a large scale.
Electric Appliances (Catalog 44-A). 32 pp., 8½ x 11 ins. Deals with accessories for home use.

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Otis Elevator Company, 260 Eleventh Ave., New York, N. Y.
Otis Push Button Controlled Elevators. Descriptive leaflets, 8½ x 11 ins. Illustrated. Full details of machines, motors and controllers for these types.
Otis Geared and Gearless Traction. Elevators of All Types. Descriptive leaflets, 8½ x 11 ins. Illustrated. Full details of machines, motors and controllers for these types.
Escalators. Booklet, 8½ x 11 ins., 22 pp. Illustrated. Describes use of escalators in subways, department stores, theaters and industrial buildings. Also includes elevators and dock elevators.

Richards-Wilcox Mfg. Co., Aurora, Ill.
Elevators. Booklet, 8½ x 11 ins., 24 pp. Illustrated. Describes complete line of "Ideal" elevator door hardware and checking devices, also automatic safety devices.

Sedgwick Machine Works, 151 West 15th St., New York, N. Y.
Catalog and descriptive pamphlets, 4¼ x 8¼ ins., 70 pp. Illustrated. Descriptive pamphlets on hand power freight elevators, sidewalk elevators, automobile elevators, etc.
Catalog and pamphlets, 8½ x 11 ins. Illustrated. Important data on different types of elevators.

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Otis Elevator Company, 260 Eleventh Ave., New York, N. Y.
Escalators. Booklet, 32 pp., 8½ x 11 ins. Illustrated. A valuable work on an important item of equipment.

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H. W. Covert Company, 243 East 44th Street, New York, N. Y.
Covert Fireplace Construction. Booklet, 12 pp., 8½ x 11 ins. Illustrated. Valuable data on an important topic.

FIREPROOFING

Concrete Engineering Co., Omaha, Neb.
Handbook of Fireproof Construction. Booklet, 54 pp., 8½ x 11 ins. Valuable work on methods of fireproofing.

Concrete Steel Company, 42 Broadway, New York.
Economical Fireproof Floors for Suburban Buildings. Folder. 4 pp., 8½ x 11 ins. Illustrated.

North Western Expanded Metal Co., 407 South Dearborn Street, Chicago, Ill.
A. I. A. Sample Book. Bound volume, 8½ x 11 ins. Contains actual samples of several materials and complete data regarding their use.

FLOOR HARDENERS (CHEMICAL)

Master Builders Co., Cleveland, Ohio.
Concrete Floor Treatment. File, 50 pp. Data on securing hardened dustproof concrete.
Concrete Floor Treatments—Specification Manual. Booklet, 24 pp., 8½ x 11 ins. Illustrated. Valuable work on an important subject.

Minwax Company, 11 West 42nd Street, New York, N. Y.
Concrete Floor Treatments. Folder, 4 pp., 8½ x 11 ins. Illustrated.

Sonneborn Sons, Inc., L., 116 Fifth Ave., New York, N. Y.
Lapidolith, the liquid chemical hardener. Complete sets of specifications for every building type in which concrete floors are used, with descriptions and results of tests.

Toch Brothers, New York, Chicago, Los Angeles.
Handbook of R. I. W. Protective Products. Booklet, 40 pp., 4½ x 7½ ins.

FLOORS—STRUCTURAL

Concrete Steel Company, 42 Broadway, New York.
Structural Economies for Concrete Floors and Roofs. Brochure, 32 pp., 8½ x 11 ins. Illustrated.

Truscon Steel Co., Youngstown, Ohio.
Truscon Floretyle Construction. Booklet, 8½ x 11 ins., 16 pp. Illustrations of actual jobs under construction. Lists of properties and information on proper construction. Proper method of handling and tables of safe loads.

Structural Gypsum Corporation, Linden, N. J.
Gypsteel Pre-cast Fireproof Floors. Booklet, 36 pp., 8½ x 11 ins. Illustrated. Data on flooring.

FLOORING

Armstrong Cork Co. (Linoleum Division), Lancaster, Pa.
Armstrong's Linoleum Floors. Catalog, 8½ x 11 ins., 44 pp. Color plates. A technical treatise on linoleum, including table of gauges and weights and specifications for installing linoleum floors. Newly revised, February, 1929.
Armstrong's Linoleum Pattern Book, 1929. Catalog, 9 x 12 ins., 44 pp. Color plates. Reproduction in color of all patterns of linoleum and cork carpet in the Armstrong line.
Linoleum Layer's Handbook. 5 x 7 ins., 36 pp. Instructions for linoleum layers and others interested in learning most satisfactory methods of laying and taking care of linoleum.
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SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 74*

FLOORING—Continued

Blabon Company, Geo. W., Nicetown, Philadelphia, Pa.
Planning the Color Schemes for Your Home. Brochure, illustrated in color; 36 pp., 7½ x 10½ ins. Gives excellent suggestions for use of color in flooring for houses and apartments.
Handy Quality Sample Folder of Linoleums. Gives actual samples of "Battleship Linoleum," cork carpet, "Feltex," etc.
Blabon's Linoleum. Booklet, illustrated in color; 128 pp., 3½ x 8½ ins. Gives patterns of a large number of linoleums.
Blabon's Plain Linoleum and Cork Carpet. Gives quality samples, 3 x 6 ins. of various types of floor coverings.

Cellized Oak Flooring, Memphis, Tenn.
Style in Oak Floors. Booklet, 16 pp., 6 x 9 ins. Illustrated.

Congoleum-Nairn, Inc., 195 Belgrove Drive, Kearny, N. J.
Facts you should know about Resilient Floors. A series of booklets on floors for (1) schools, (2) hospitals, (3) offices, (4) stores, (5) libraries, (6) churches, (7) Clubs and Lodges, (8) apartments and hotels. Illustrated.
Specifications for Resilient Floors. Booklet, 12 pp. A reprint from Sweet's.
A New Kind of Floor Service. Brochure, 8 pp. Data on Bonded Floors.
Sealex Battleship Linoleum. Booklet, 12 pp. Illustrated. Shows typical installations.
Sealex Treadlite Tiles. Two booklets, 8 and 16 pp. Illustrated.
Colonial Planks. Brochure, 8 pp. Illustrated.

National Lumber Manufacturers' Association, Transportation Building, Washington.
Wood Floors. Booklet. 30 pp., 8½ x 11 ins. Illustrated.

C. Pardee Works, 9 East 45th St., New York, N. Y., and 1600 Walnut St., Philadelphia, Pa.
Pardee Tiles. Bound Volume, 48 pp., 8½ x 11 ins. Illustrated.

Structural Gypsum Corporation, Linden, N. J.
Gypsteel Pre-cast Fireproof Floors. Booklet, 36 pp., 8½ x 11 ins. Illustrated. Data on floorings.

U. S. Gypsum Co., Chicago.
Pyrobar Floor Tile. Folder, 8½ x 11 ins. Illustrated. Data on building floors of hollow tile and tables on floor loading.

U. S. Rubber Co., 1790 Broadway, New York, N. Y.
Period Adaptations for Modern Floors. Brochure, 8 x 11 ins., 60 pp. Richly Illustrated. A valuable work on the use of rubber tile for flooring in interiors of different historic styles.

FURNITURE

American Seating Co., 14 E. Jackson Blvd., Chicago, Ill.
Art Ecclesiastical Booklet, 6 x 9 ins., 48 pp. Illustrations of church fitments in carved wood.
Theatre Chairs. Booklet, 6 x 9 ins., 48 pp. Illustrations of theatre chairs.

Kittinger Co., 1893 Elmwood Ave., Buffalo, N. Y.
Kittinger Club & Hotel Furniture. Booklet, 20 pp., 6¾ x 9½ ins. Illustrated. Deals with fine line of furniture for hotels, clubs, institutions, schools, etc.
Kittinger Club and Hotel Furniture. Booklet, 20 pp., 6 x 9 ins. Illustrated. Data on furniture for hotels and clubs.
A Catalog of Kittinger Furniture. Booklet, 78 pp., 11 x 14 ins. Illustrated. General Catalog.

McKinney Mfg. Co., Pittsburgh, Pa.
Forethought Furniture Plans. Sheets, 6¾ x 9 ins., drawn to ¼-inch scale. An ingenious device for determining furniture arrangement.

GLASS CONSTRUCTION

Adamson Flat Glass Co., Clarksburg, W. Va.
Quality and Dependability. Folder, 2 pp., 8½ x 11 ins. Illustrated. Data in the company's product.

Libbey-Owens Sheet Glass Co., Toledo, Ohio.
Flat Glass. Brochure, 12 pp., 5⅛ x 7⅝ ins. Illustrated. History of manufacture of flat, clear, sheet glass.

GREENHOUSES

King Construction Company, North Tonawanda, N. Y.
King Greenhouses for Home or Estate. Portfolio of half-tone prints, varnishes, 8¾ x 10½ ins.

William H. Lutton Company, 267 Kearney Ave., Jersey City, N. J.
Greenhouses of Quality. Booklet, 50 pp., 8½ x 11 ins. Illustrated. Conservatories making use of Lutton Patented Galvanized Steel V-Bar.

HARDWARE

P. & F. Corbin, New Britain, Conn.
Early English and Colonial Hardware. Brochure, 8½ x 11 ins. An important illustrated work on this type of hardware.
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Colonial and Early English Hardware. Booklet, 48 pp., 8½ x 11 ins. Illustrated. Data on hardware for houses in these styles.

Cutler Mail Chute Company, Rochester, N. Y.
Cutler Mail Chute Model F. Booklet, 4 x 9¼ ins., 8 pp. Illustrated.

HARDWARE—Continued

Richards-Wilcox Mfg. Co., Aurora, Ill.
Distinctive Garage Door Hardware. Booklet, 8½ x 11 ins., 66 pp. Illustrated. Complete information accompanied by data and illustrations on different kinds of garage door hardware.
Distinctive Elevator Door Hardware. Booklet, 90 pp., 10½ x 16 ins. Illustrated.

Russell & Erwin Mfg. Co., New Britain, Conn.
Hardware for the Home. Booklet, 24 pp., 3½ x 6 ins. Deals with residence hardware.
Door Closer Booklet. Brochure, 16 pp., 3½ x 6 ins. Data on a valuable detail.
Garage Hardware. Booklet, 12 pp., 3½ x 6 ins. Hardware intended for garage use.
Famous Homes of New England. Series of folders on old homes and hardware in style of each.

HEATING EQUIPMENT

American Blower Co., 6004 Russell St., Detroit, Mich.
Heating and Ventilating Utilities. A binder containing a large number of valuable publications, each 8½ x 11 ins., on these important subjects.

American Radiator Company, The, 40 West 40th St., N. Y. C.
Ideal Boilers for Oil Burning. Catalog 5½ x 8½ ins., 36 pp. Illustrated in 4 colors. Describing a line of Heating Boilers especially adapted to use with Oil Burners.
Corto—The Radiator Classic. Brochure, 5½ x 8½ ins., 16 pp. Illustrated. A brochure on a space-saving radiator of beauty and high efficiency.
Ideal Arcola Radiator Warmth. Brochure, 6¾ x 9½ ins. Illustrated. Describes a central all-on-one-floor heating plant with radiators for small residences, stores, and offices.
How Shall I Heat My Home? Brochure, 16 pp., 5¾ x 8½ ins. Illustrated. Full data on heating and hot water supply.
New American Radiator Products. Booklet, 44 pp., 5 x 7¾ ins. Illustrated. Complete line of heating products.
A New Heating Problem. Brilliantly Solved. Broadside, 4 pp., 10¾ x 15 ins. Illustrated. Data on the IN-AIRID invisible air valve.
In-Airid, the Invisible Air Valve. Folder, 8 pp., 3½ x 6 ins. Illustrated. Data on a valuable detail of heating.
The 999 ARCO Packless Radiator Valve. Folder, 8 pp., 3½ x 6 ins. Illustrated.

James B. Clow & Sons, 534 S. Franklin St., Chicago, Ill.
Clow Gasteam Vented Heating System. Brochure, 24 pp., 8½ x 11 ins. Illustrated. Deals with a valuable form of heating equipment for using gas.

C. A. Dunham Company, 450 East Ohio St., Chicago, Ill.
Dunham Radiator Trap. Bulletin 101, 8 x 11 ins., 12 pp. Illustrated. Explains working of this detail of heating apparatus.
Dunham Packless Radiator Valves. Bulletin 104, 8 x 11 ins., 8 pp. Illustrated. A valuable brochure on valves.
Dunham Return Heating System. Bulletin 109, 8 x 11 ins. Illustrated. Covers the use of heating apparatus of this kind.
Dunham Vacuum Heating System. Bulletin 110, 8 x 11 ins., 12 pp. Illustrated.
The Dunham Differential Vacuum Heating System. Bulletin 114. Brochure, 12 pp., 8 x 11 ins. Illustrated. Deals with heating for small buildings.
The Dunham Differential Vacuum Heating System. Bulletin 115. Brochure, 12 pp., 8 x 11 ins. Illustrated. Deals with heating for large buildings.

The Fulton Sylphon Company, Knoxville, Tenn.
Sylphon Temperature Regulators. Illustrated brochures, 8½ x 11 ins., dealing with general architectural and industrial applications; also specifically with applications of special instruments.
Sylphon Heating Specialties. Catalog No. 200, 192 pp., 3½ x 6¼ ins. Important data on heating.

Hoffman Specialty Company, Inc., 25 West 45th St., New York, N. Y.
Heat Controlled With the Touch of a Finger. Booklet, 46 pp., 5¾ x 8¾ ins. Illustrated.
How to Lock Out Air, the Heat Thief. Brochure, 48 pp., 5 x 7¼ ins. Illustrated.

Janette Manufacturing Company, 556 West Monroe Street, Chicago.
More Heat from Any Hot Water System on Less Fuel. Folder. 4 pp., 8½ x 11 ins. Illustrated. Deals with use of the "Hydrolator."

S. T. Johnson Co., Oakland, Calif.
Johnson Oil Burners. Booklet, 9 pp., 8½ x 11 ins. Illustrated
Bulletin No. 4A. Brochure, 8 pp., 8½ x 11 ins. Illustrated. Data on different kinds of oil-burning apparatus.
Bulletin No. 31. Brochure, 8 pp., 8½ x 11 ins. Illustrated. Deals with Johnson Rotary Burner with Full Automatic Control.

Kewanee Boiler Corporation, Kewanee, Ill.
Kewanee on the Job. Catalog, 8½ x 11 ins., 80 pp. Illustrated. Showing installations of Kewanee boilers, water heaters, radiators. etc.
Catalog No. 78, 6 x 9 ins. Illustrated. Describes Kewanee Firebox Boilers with specifications and setting plans.
Catalog No. 79, 6 x 9 ins. Illustrated. Describes Kewanee power boilers and smokeless tubular boilers with specifications.

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At right: Hospital Group of Buildings, University of Virginia, Charlottesville, Va.

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HEATING EQUIPMENT—Continued

May Oil Burner Corp., Baltimore, Md.

Adventures in Comfort. Booklet, 24 pp., 6 x 9 ins. Illustrated. Non-technical data on oil as fuel.

Taking the Quest Out of the Question. Brochure, 16 pp., 6 x 9 ins. Illustrated. For home owners interested in oil as fuel.

McQuay Radiator Corporation, 35 East Wacker Drive, Chicago, Ill.

McQuay Visible Type Cabinet Heater. Booklet, 4 pp., 8½ x 11 ins. Illustrated. Cabinets and radiators adaptable to decorative schemes.

McQuay Concealed Radiators. Brochure, 4 pp., 8½ x 11 ins. Illustrated.

McQuay Unit Heater. Booklet, 8 pp., 8½ x 11 ins. Illustrated. Gives specifications and radiator capacities.

Modine Mfg. Co., Racine, Wisc.

Modine Copper Radiation. Booklet, 28 pp. 8½ x 11 ins. Illustrated. Deals with industrial, commercial and domestic heating.

A Few Short Years. Folder. 4 pp. 8½ x 11 ins. Illustrated. Heating for garages.

Dairy Plant Heating. Folder. 4 pp., 8½ x 11 ins. Illustrated.

Industrial Heating. Folder. 4 pp., 8½ x 11 ins. Illustrated.

Modine Unit Heater. Folder. 6 pp., 8½ x 11 ins. Illustrated.

Nash Engineering Company, South Norwalk, Conn.

Bulletin 85. Booklet. 12 pp. 10¾ x 7½ ins. Illustrated in color. Describes construction and operation of the Jennings Return Line Vacuum Heating Pump.

Bulletin 87. Brochure. 8 pp. 10¾ x 7½ ins. Illustrated in color. Deals with Sizes T and U Jennings Vacuum Heating Pump for 2500 and 5000 square feet equivalent direct radiation.

Bulletin 63. Booklet. 4 pp. 10¾ x 7½ ins. Illustrated. Describes in detail the Unit Type Motor Driven Jennings Condensation Pump.

National Radiator Corporation, Johnstown, Pa.

Aero Radiators; Beauty and Worth. Catalog 34. Booklet, 6 x 9 ins., 20 pp., describing and illustrating radiators and accessories.

Six Great Companies Unite to Form a Great Corporation. Booklet, 28 pp., 8½ x 10½ ins. Illustrated. Valuable data on heating.

Prometheus Electric Corporation, 360 West 13th St., New York.

Electric Heating Specialties. Booklet, 24 pages. 8½ x 11 ins. Illustrated. Specialties for heating, cooking, hospitals, organ lofts, etc.

Rome Brass Radiator Corporation, 1 East 42nd Street, New York.

Proof of the Pudding. Booklet, 24 pp., 8½ x 10½ ins. Illustrated. Describes Robras, 20-20 concealed-within-the-walls, lightweight, all-brass radiators.

Within the Walls. Brochure, 16 pp., 4 x 9 ins. Illustrated. Gives facts regarding modern, out-of-sight, lightweight, Robras 20-20 radiators.

Engineering Data. Booklet, 16 pp., 8½ x 10½ ins. Illustrated. Full data and tables to facilitate selection and installation of Robras 20-20 concealed radiators for steam, water and vapor heating systems.

Small Bathrooms Made More Spacious, Brochure, 4 pp. Illustrated. Gives descriptions, sizes and prices of Robras lightweight cabinet radiators to be installed under wash basins.

Sarco Company, Inc., 183 Madison Ave., New York City, N. Y.

Steam Heating Specialties. Booklet, 6 pp., 6 x 9 ins. Illustrated. Data on Sarco Packless Supply Valves and Radiator Traps for vacuum and vapor heating systems.

Equipment Steam Traps and Temperature Regulations. Booklet, 6 pp., 6 x 9 ins. Illustrated. Deals with Sarco Steam Traps for hospital, laundry and kitchen fixtures and the Sarco Self-contained Temperature Regulation for hot water service tanks.

Spencer Heater Co., Williamsport, Pa.

Catalog. Booklet, 20 pp., 6⅛ x 9 ins. Illustrated. Complete line of magazine feed cast iron sectional and steel tubular heaters.

The Fire that Burns Uphill. Brochure, 24 pp., 6⅛ x 9¼ ins. Illustrated in color. Magazine feed heaters for steam, vapor and hot water heating.

B. F. Sturtevant Company, Hyde Park, Boston, Mass.

Tempervane Heating Units. Catalog 363. Booklet, 44 pp., 8½ x 11 ins. Illustrated. Data on "Heating Every Corner with Maximum Economy."

Trane Co., The, La Crosse, Wis.

Bulletin 14, 16 pp., 8½ x 10⅝ ins. Covers the complete line of Trane Heating Specialties, including Trane Bellows Traps, and Trane Bellows Packless Valves.

Bulletin 20. 24 pp., 8½ x 10⅝ ins. Explains in detail the operation and construction of Trane Condensation. Vacuum, Booster, Circulating, and similar pumps.

How to Cut Heating Costs. Booklet, 18 pp., 8½ x 11 ins. Illustrated.

HOISTS, TELESCOPIC

Gillis & Geoghegan, Inc. 535 West Broadway, New York.

G & G Telescopic Hoist. Booklet. 24 pp. 8½ x 11 ins. Illustrated complete data on hoists.

Ash Removal. Folder. 8½ x 11 ins. Illustrated. Hoists for removing ashes from basements.

HOSPITAL EQUIPMENT

The Frink Co., Inc., 369 Lexington Ave., New York City.

Catalog 426. 7 x 10 ins., 16 pp. A booklet illustrated with photographs and drawings, showing the types of light for use in hospitals, as operating table reflectors, linolite and multilite concentrators, ward reflectors, bed lights and microscopic reflectors, giving sizes and dimensions, explaining their particular fitness for special uses.

Holophane Company, 342 Madison Avenue, New York.

Lighting Specific for Hospitals. Booklet, 30 pp., 8½ x 11 ins. Illustrated.

The International Nickel Company, 67 Wall St., New York, N. Y.

Hospital Applications of Monel Metal. Booklet, 8½ x 11½ ins., 16 pp. Illustrated. Gives types of equipment in which Monel Metal is used, reasons for its adoption, with sources of such equipment.

Pick-Barth Company, Inc., Albert, 1200 West 35th St., Chicago, and Cooper Square, New York.

Some Thoughts About Hospital Food Service Equipment. Booklet, 22 pp., 7½ x 9¼ ins. Valuable data on an important subject.

Prometheus Electric Corporation, 360 West 13th St., New York.

Electric Heating Specialties. Booklet, 24 pages. 8½ x 11 ins. Illustrated. Specialties for heating, cooking, hospitals, organ lofts, etc.

HOTEL EQUIPMENT

Pick-Barth Company, Inc., Albert, 1200 West 35th St., Chicago, and Cooper Square, New York.

Some Thoughts on Furnishing a Hotel. Booklet, 7½ x 9 ins. Data on complete outfitting of hotels.

INCINERATORS

Home Incinerator Co., Milwaukee, Wis.

The Decent Way. Burn it with Gas. Brochure, 30 pp., 5¼ x 7¼ ins., inside. Illustrated. Incinerator sanitation equipment for residence use.

A. I. A. File, 12 pp., 8¾ x 10¾ ins., inside. Suggestions for architect on incineration, showing installation and equipment.

Specialized Home Comforts Service Plan Book. 40 pp., 8½ x 11 ins., inside. Illustrated. A complete outline of the many advantages of incineration.

Blue Star Standards in Home Building. 16 pp., 5½ x 8½ ins., inside. Illustrated. Explaining fully the Blue Star principles, covering heat, incineration, refrigeration, etc.

Josam Mfg. Co., Michigan City, Ind.

Josam-Graver Incinerators. Folder, 4 pp., 8½ x 11 ins. Illustrated.

Kerner Incinerator Company, 715 E. Water St., Milwaukee, Wis.

Incinerators (Chimney-fed). Catalog No. 15 (Architect and Builders' Edition). Size 8½ x 11 ins., 16 pp. Illustrated. Describes principles and design of Kernerator Chimney-fed Incinerators for residences, apartments, hospitals, schools, apartment hotels, clubs and other buildings. Shows all standard models and gives general information and working data.

Sanitary Elimination of Household Waste. Booklet, 4 x 9 ins. 16 pp. Illustrated. Gives complete information on the Kernerator for residences.

Garbage and Waste Disposal for Apartment Buildings. Folder, 8½ x 11 ins., 16 pp. Illustrated. Describes principle and design of Kernerator Chimney-fed Incinerator for apartments and gives list of buildings where it has been installed.

Sanitary Disposal of Waste in Hospitals. Booklet, 4 x 9 ins., 12 pp. Illustrated. Shows how this necessary part of hospital service is taken care of with the Kernerator. Gives list of hospitals where installed.

The Kernerator (Chimney-fed) Booklet. Catalog No. 17, 20 pp., 8½ x 11 ins. Illustrated. Data on a valuable detail of equipment.

INSULATION

Armstrong Cork & Insulation Co., Pittsburgh, Pa.

The Insulation of Roofs with Armstrong's Corkboard. Booklet. Illustrated. 7½ x 10½ ins., 32 pp. Discusses means of insulating roofs of manufacturing or commercial structures.

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Armstrong's Corkboard. Insulation for Walls and Roofs of Buildings. Booklet, 66 pp., 9½ x 11¾ ins. Illustrates and describes use of insulation for structural purposes.

National Lumber Manufacturers' Association, Transportation Building, Washington.

The Cost of Comfort. Booklet. 80 pp., 8½ x 11 ins. Illustrated. A handbook on the economies of dwelling insulation.

Structural Gypsum Corporation, Linden, N. J.

Heat Insulation Value of Gypsteel. Folder, 4 pp., 8½ x 11 ins. Brochure, by Charles L. Norton, of M. I. T.

JOISTS

Bates Expanded Steel Truss Co., East Chicago, Ind.

Catalog No. 4. Booklet, 32 pp., 8½ x 11 ins. Illustrated. Gives details of truss construction with loading tables and specifications.

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Concrete Steel Company, 42 Broadway, New York, N. Y.
Structural Economies for Concrete Floors and Roofs. Booklet, 32 pp., 8½ x 11 ins. Illustrated.
Modern Concrete Reinforcement. Brochure, 32 pp., 8½ x 11 ins. Illustrated.
Construction Details for Installing Havemeyer Trusses. Data sheets, 8½ x 11 ins. Illustrated.
Standard Practice for Placing Havemeyer Reinforcement in Columns, Beams and Slabs. Data sheets, 8½ x 11 ins. Illustrated.

KITCHEN EQUIPMENT

The International Nickel Company, 67 Wall St., New York, N. Y.
Hotels, Restaurants and Cafeteria Applications of Monel Metal. Booklet, 8½ x 11 ins., 32 pp. Illustrated. Gives types of equipment in which Monel Metal is used, with service data and sources of equipment.

Prometheus Electric Corporation, 360 West 13th St., New York.
Electric Heating Specialties. Booklet, 24 pages. 8½ x 11 ins. Illustrated. Specialties for heating, cooking, hospitals, organ lofts, etc.

John Van Range Co., Cincinnati.
Practical Planning for Church Food Service. Booklet, 32 pp., 8½ x 11 ins. Illustrated.
Practical Planning for School Service. Booklet, 32 pp., 8½ x 11 ins. Illustrated.

LABORATORY EQUIPMENT

Alberene Stone Co., 153 West 23rd Street, New York City.
Booklet, 8¾ x 11¼ ins., 26 pp. Stone for laboratory equipment, shower partitions, stair treads, etc.

Duriron Company, Dayton, Ohio.
Duriron Acid, Alkali and Rust-proof Drain Pipe and Fittings. Booklet, 8½ x 11 ins., 20 pp. Full details regarding a valuable form of piping.

LANTERNS

Todhunter, Arthur, 119 E. 57th St., New York, N. Y.
Hand-wrought Lanterns. Booklet, 5¼ x 6¾ ins., 20 pp. Illustrated in black and white. With price list. Lanterns appropriate for exterior and interior use, designed from old models and meeting the requirements of modern lighting.

LATH, METAL AND REINFORCING

Milwaukee Corrugating Co., Milwaukee.
The Milcor Manual. Booklet, 96 pp., 8½ x 11 ins. Illustrated. Data on metal lath and similar materials.
Milcor Metal Ceiling Catalog. Booklet, 288 pp., 8½ x 11 ins. Illustrated. Data on metal ceiling and wall construction.

National Steel Fabric Co., Pittsburgh, Pa.
Better Walls for Better Homes. Brochure, 16 pp., 7¾ x 11¾ ins. Illustrated. Metal lath, particularly for residences.
Steeltex for Floors. Booklet, 24 pp., 8½ x 11 ins. Illustrated. Combined reinforcing and form for concrete or gypsum floors and roofs.
Steeltex Data Sheet No. 1. Folder, 8 pp., 8½ x 11 ins. Illustrated. Steeltex for floors on steel joists with round top chords.
Steeltex Data Sheet No. 2. Folder, 8 pp., 8½ x 11 ins. Illustrated. Steeltex for floors on steel joists with flat top flanges.
Steeltex Data Sheet No. 3. Folder, 8 pp., 8½ x 11 ins. Illustrated. Steeltex for folders on wood joists.

North Western Expanded Metal Co., 1234 Old Colony Building, Chicago, Ill.
North Western Expanded Metal Products. Booklet, 8½ x 10¾ ins., 20 pp. Fully illustrated, and describes different products of this company, such as Kno-burn metal lath, 20th Century Corrugated. Plasta-saver and longspan lath channels, etc.
Longspan ¾-inch Rib Lath. Folder, 4 pp., 8½ x 11 ins. Illustrated. Deals with a new type of V-Rib expanded metal.
A. I. A. Sample Book. Bound volume, 8½ x 11 ins. Contains actual samples of several materials and complete data regarding their use.
Norwest Metal Lath. Folder, 8½ x 11 ins. Illustrated. Data on Flat Rib Lath.

Truscon Steel Company, Youngstown, Ohio.
Truscon ¾-inch Hy-Rib for Roofs, Floors and Walls. Booklet, 8½ x 11 ins., illustrating Truscon ¾-inch Hy-Rib as used in industrial buildings. Plates of typical construction. Progressive steps of construction. Specification and load tables.

LAUNDRY MACHINERY

Troy Laundry Machinery Co., Inc., 9 Park Place, New York City.
Laundry Machinery for Large Institutions. Loose-leaf booklet, 50 pp., 8½ x 11 ins. Illustrated.
Laundry Machinery for Small Institutions. Loose-leaf brochure, 50 pp., 8½ x 11 ins. Illustrated.
Accessory Equipment for Institutional Laundries. Leather bound book, 50 pp., 8½ x 11 ins. Illustrated.
Dry Cleaning Equipment for Institutional Purposes. Brochure, 50 pp., 8½ x 11 ins. Illustrated.

LIGHTING EQUIPMENT

The Frink Co., Inc., 369 Lexington Ave., New York, N. Y.
Catalog 415, 8½ x 11 ins., 46 pp. Photographs and scaled cross-sections. Specialized bank lighting, screen and partition reflectors, double and single desk reflectors and Polaralite Signs.

Holophane Company, Inc., 342 Madison Ave., New York, N. Y.
The Lighting of Schools; A Guide to Good Practice. Booklet. 24 pp., 8½ x 11 ins. Illustrated.
Lighting Specifications for Hospitals. Brochure, 30 pp., 8½ x 11 ins. Illustrated.
Industrial Lighting. Bulletin 448A. Booklet, 24 pp., 8½ x 11 ins. Illustrated.
Holophane Catalog. Booklet, 48 pp., 8½ x 11 ins. Combination catalog and engineering data book.
The Lighting of Schools. A Guide to Good Practice. Booklet, 24 pp., 8½ x 11 ins. Illustrated.

Smyser-Royer Co., 1700 Walnut Street, Philadelphia, Pa.
Catalog "J" on Exterior Lighting Fixtures. Brochure, illustrated, giving data on over 300 designs of standards, lanterns and brackets of bronze or cast iron.

Todhunter, 119 East 57th St., New York, N. Y.
Lighting Fixtures, Lamps and Candlesticks. 24 pp., 8½ x 11 ins. Illustrated. Fine assortment of lighting accessories.

Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.
Industrial Lighting Equipment. Booklet, 32 pp., 8½ x 11 ins. Illustrated.
Commercial Lighting. Brochure, 24 pp., 8½ x 11 ins. Illustrated.
Airport and Floodlighting Equipment. Booklet, 20 pp., 8½ x 11 ins. Illustrated.

LUMBER

National Lumber Mfrs. Assn., Washington, D. C.
Use of Lumber on the Farm. Booklet, 38 pp., 8½ x 11 ins. Illustrated.

MAIL CHUTES

Cutler Mail Chute Company, Rochester, N. Y.
Cutler Mail Chute Model F. Booklet, 4 x 9¼ ins., 8 pp. Illustrated.

MANTELS

Henry Klein & Co., Inc. 40-46 West 23rd Street, New York.
Driwood Mantels. Booklet. 12 pp. 8½ x 11 ins. Illustrated. Fine line of eighteenth century English and American mantels.

Arthur Todhunter, 119 E. 57th St., New York, N. Y.
Georgian Mantels. New booklet, 24 pp., 5¾ x 6¾ ins. A fully illustrated brochure on eighteenth century mantels. Folders give prices of mantels and illustrations and prices of fireplace equipment.

MARBLE

The Georgia Marble Company, Tate, Ga.; New York Office, 1328 Broadway.
Why Georgia Marble Is Better. Booklet, 3⅜ x 6 ins. Gives analysis, physical qualities, comparison of absorption with granite, opinions of authorities, etc.
Convincing Proof. 3⅜ x 6 ins., 8 pp. Classified list of buildings and memorials in which Georgia Marble has been used, with names of Architects and Sculptors.
Hurt Building, Atlanta; Senior High School and Junior College, Muskegon, Mich. Folders, 4 pp., 8½ x 11 ins. Details.

METALS

Aluminum Company of America, Pittsburgh.
Architectural Aluminum. Brochure, 30 pp., 8½ x 11 ins. Illustrated. An excellent booklet on the subject.

Central Alloy Steel Corporation, Massillon, Ohio.
Sheet Iron Primer. Booklet, 64 pp., 5¼ x 7¾ ins. Illustrated.
The Path to Permanence. Brochure, 52 pp., 8½ x 11 ins. Illustrated. Data on sheet iron.

The International Nickel Company, 67 Wall St., New York, N. Y.
Monel Metal Primer. 8 folders, 4 pp., 8½ x 11 ins. Illustrated. Valuable data on use of monel in kitchens, laundries, etc.

MILL WORK—See also Wood

Curtis Companies Service Bureau, Clinton, Iowa.
Architectural Interior and Exterior Woodwork. Standardized Book, 9 x 11½ ins., 240 pp. Illustrated. This is an Architects' Edition of the complete catalog of Curtis Woodwork, as designed by Trowbridge & Ackerman. Contains many color plates.
Better Built Homes. Vols. XV-XVIII, incl. Booklet, 9 x 12 ins., 40 pp. Illustrated. Designs for houses of five to eight rooms, respectively, in several authentic types, by Trowbridge & Ackerman, architects for the Curtis Companies.
Curtis Details. Booklet, 19¼ x 23½ ins., 20 pp. Illustrated. Complete details of all items of Curtis woodwork, for the use of architects.
Curtis Cabinet and Stair Work. Booklet, 48 pp., 7¾ x 10½ ins. Illustrated.

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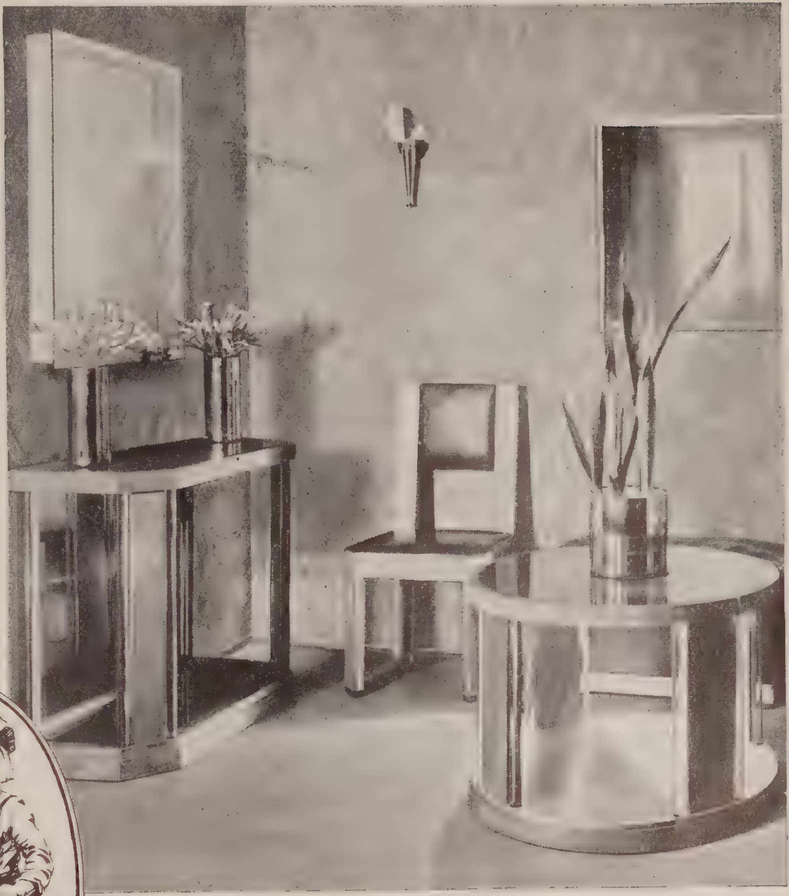
TEXTURED FINISHES

in the Modern Manner

created with white-lead and oil plastic paint



The texture shown here, produced with a whisk broom, is particularly suited to rooms designed in the modern manner.

Low-relief wall textures that carry out the spirit of modern interior decoration easily obtained with Dutch Boy white-lead—for years the standard in making exterior and interior paint.

WHAT is the spirit of the interiors you design? Old English? Spanish? Italian? Modern?

In every case you may have textured side wall decoration in keeping by using white-lead and oil plastic paint.

More and more architects are specifying this plastic paint, made with Dutch Boy white-lead, Dutch Boy flatting oil, whiting and drier when they want an interesting modified texture finish. They find this "plastic lead" lends itself to the creation of all kinds of appropriate treatments and gives finishes with the durability and washability that are such outstanding characteristics of lead-and-oil paint.

These advantages . . . White-lead and oil plastic paint is easy to mix, tint, apply and texture. It is mixed of materials the painter carries regularly in his shop—Dutch Boy white-lead, dry whiting, Dutch Boy flatting oil, and drier. It is tinted in the usual way with colors-in-oil. It is applied with a paint brush, remaining workable on the wall for about an hour and thus permitting the handling of large wall areas conveniently. It can be textured with a sponge, paint brush, whisk-broom, graining comb and in many other ways.

Applied today, a "plastic lead" finish is ready for glazing tomorrow. It sets up sufficiently overnight to take a glaze properly. Many beautiful glazed effects are possible. However, glazing is not necessary in order to produce a washable finish with white-lead and oil plastic paint. By itself, this plastic paint can be used to give a complete finish and one which is thoroughly washable.

. . . For further information about white-lead and oil plastic paint and illustrations of various textures, write to our Department of Color Research and Decoration for the booklet, "White-Lead and Oil Plastic Finishes." Address your inquiry to our nearest branch.

· · FORMULA · ·

The formula for white-lead and oil plastic paint is 100 lbs. Dutch Boy white-lead (heavy paste), 22 lbs. dry whiting, 1½ gals. Dutch Boy flatting oil, ¼ pint drier. Break up the whiting with the flatting oil and drier. Stir this mixture into the white-lead. The "plastic lead" is now ready for application.

Dutch Boy Red-Lead

Dutch Boy red-lead makes paint that insures complete protection for metal surfaces. Proven beyond question in its ability to lengthen the life of iron and steel, this paint is accepted as the standard. Three coats of paint—made with Dutch Boy red-lead—form a protective coating that eliminates danger from corrosion.

NATIONAL LEAD COMPANY

New York, 111 Broadway ✓ Buffalo, 116 Oak Street ✓ Chicago, 900 West 18th Street ✓ Cincinnati, 659 Freeman Avenue ✓ Cleveland, 820 West Superior Avenue ✓ St. Louis, 722 Chestnut Street ✓ San Francisco, 235 Montgomery Street ✓ Boston, National-Boston Lead Co., 800 Albany Street ✓ Pittsburgh, National Lead & Oil Co., of Pa., 316 Fourth Avenue ✓ Philadelphia, John T. Lewis & Bros. Co., Widener Bldg.

DUTCH BOY WHITE-LEAD

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 80*

MILL WORK—See also Wood—Continued

Curtis Windows. Brochure, 7¾ x 10½ ins. Illustrated.

Curtis Interior Doors. Booklet, 7¾ x 10½ ins. Illustrated.

Curtis Entrances and Exterior Doors. Brochure, 7¾ x 10½ ins. Illustrated.

Hartmann-Sanders Company, 2155 Elston Ave., Chicago, Ill.

Column Catalog, 7½ x 10 ins., 48 pp. Illustrated. Contains prices on columns 6 to 36 ins. diameter, various designs and illustrations of columns and installations.

The Pergola Catalog. 7½ x 10 ins., 64 pp. Illustrated. Contains illustrations of pergola lattices, garden furniture in wood and cement, garden accessories.

Klein & Co., Inc., Henry, 11 East 37th St., New York, N. Y.

Two Driwood Interiors. Folder, 4 pp., 6¼ x 9 ins. Illustrated. Use of moulding for paneling walls.

A New Style in Interior Decoration. Folder, 4 pp., 6¼ x 9 ins. Illustrated. Deals with interior woodwork.

Driwood Period Mouldings in Ornamented Wood. Booklet, 28 pp., 8½ x 11 ins. Illustrated.

How Driwood Period Mouldings in Ornamented Wood Set a New Style in Decoration. Folder.

Roddis Lumber and Veneer Co., Marshfield, Wis.

Roddis Doors. Brochure, 24 pp., 5¼ x 8½ ins. Illustrated price list of doors for various types of buildings.

Roddis Doors, Catalog G. Booklet, 184 pp., 8½ x 11 ins. Completely covers the subject of doors for interior use.

Roddis Doors for Hospitals. Brochure, 16 pp., 8½ x 11 ins. Illustrated work on hospital doors.

Roddis Doors for Hotels. Brochure, 16 pp., 8½ x 11 ins. Illustrated work on doors for hotel and apartment buildings.

MORTAR AND CEMENT COLORS

Clinton Metallic Paint Co., Clinton, N. Y.

Clinton Mortar Colors. Folder, 8½ x 11 ins., 4 pp. Illustrated in colors, gives full information concerning Clinton Mortar Colors with specific instructions for using them.

Color Card. 3¼ x 6½ ins. Illustrates in color the ten shades in which Clinton Mortar Colors are manufactured.

Something New in Stucco. Folder, 3½ x 6 ins. An interesting folder on the use of coloring matter for stucco coated walls.

ORNAMENTAL PLASTER

Jacobson & Co., 241 East 44th St., New York, N. Y.

A Book of Old English Designs. Brochure, 47 plates, 12 x 9 ins. Deals with a fine line of decorative plaster work.

Architectural and Decorative Ornaments. Cloth bound volume, 184 pp., 9 x 12 ins., 18 plates. Price, $3.00. A general catalog of fine plaster ornaments.

Geometrical ceilings. Booklet, 23 plates, 7 x 9 ins. An important work on decorative plaster ceilings.

PAINTS, STAINS, VARNISHES AND WOOD FINISHES

Minwax Company, Inc., 11 West 42nd St., New York.

Color Card and Specifications for Minwax Brick and Cement Coating. Folder, 4 pp., 8½ x 11 ins. Illustrated.

National Lead Company, 111 Broadway, New York, N. Y.

Handy Book on Painting. Book, 5½ x 3¼ ins., 100 pp. Gives directions and formulæ for painting various surfaces of wood, plaster, metals, etc., both interior and exterior.

Red Lead in Paste Form. Booklet, 6¼ x 3½ ins., 16 pp. Illustrated. Directions and formulæ for painting metals.

Came Lead. Booklet, 6 x 8¾ ins., 12 pp. Illustrated. Describes various styles of lead cames.

Pratt & Lambert, Inc., Buffalo, N. Y.

Specification Manual for Paint, Varnishing and Enameling. Booklet, 38 pp., 7½ x 10⅝ ins. Complete specifications for painting, varnishing and enameling interior and exterior wood, plaster, and metal work.

Sherwin-Williams Company, 601 Canal Rd., Cleveland, Ohio.

Complete Architectural Specifications for painting, varnishing and lacquering, reprinted from the Sherwin-Williams Architectural Catalogue as it appears in Sweet's Architectural Catalogue. Form Number B 303. 8½ x 11, bound in paper, thirty pages of specifications and color chips; carries A. I. A. file number.

Sonneborn Sons, Inc., L., Dept. 4, 116 Fifth Ave., New York. N. Y.

Paint Specifications. Booklet, 8½ x 10¾ ins., 4 pp.

Toch Brothers, New York, Chicago, Los Angeles.

Architects' Specification Data. Sheets in loose leaf binder, 8½ x 11 ins., dealing with an important line of materials.

U. S. Gutta Percha Paint Co., Providence, R. I.

Barreled Sunlight. Booklet, 8½ x 11 ins. Data on "Barreled Sunlight" with specifications for its use.

PARCEL DELIVERY DEVICES

Receivador Sales Company, Grand Rapids, Mich.

Architects' Portfolio. Booklet, 12 pp., 8½ x 11 ins. Illustrated. Deals with delivery problems and their solution.

PARTITIONS

Circle A. Products Corporation, New Castle, Ind.

Circle A. Partitions Sectional and Movable. Brochure. Illustrated. 8½ x 11¼ ins., 32 pp. Full data regarding an important line of partitions, along with Erection Instructions for partitions of three different types.

Dahlstrom Metallic Door Company, Jamestown, N. Y.

Dahlstrom Standard Steel Partitions. Booklet, 24 pp., 8½ x 11 ins. Illustrated.

Irving Hamlin, Evanston, Ill.

Hamlinized Folding Partitions Made from Hamlin's Evanston Soundproof Doors, Sectional and Movable. Folder, 4 pp., 8½ x 11 ins. Illustrated.

Hauserman Company, E. F., Cleveland, Ohio.

Hollow Steel Standard Partitions. Various folders, 8½ x 11 ins. Illustrated. Give full data on different types of steel partitions, together with details, elevations and specifications.

Henry Klein & Co., 25 Grand Street, Elmhurst, L. I., N. Y.

Telesco Partition. Catalog, 8¼ x 11 ins., 14 pp. Illustrated. Shows typical offices laid out with Telesco partitions, cuts of finished partition units in various woods. Gives specifications and cuts of buildings using Telesco.

Detailed Instructions for Erecting Telesco Partitions. Booklet, 24 pp., 8½ x 11 ins. Illustrated. Complete instructions, with cuts and drawings, showing how easily Telesco Partition can be erected.

Improved Office Partition Co., 25 Grand St., Elmhurst, L. I., N. Y. (See Henry Klein & Co.)

Richards-Wilcox Mfg. Co., Aurora, Ill.

Partitions. Booklet, 7 x 10 ins., 32 pp. Illustrated. Describes complete line of track and hangers for all styles of sliding parallel, accordion and flush-door partitions.

Telesco Office Partition, 25 Grand St., Elmhurst, L. I., N. Y. (See Henry Klein & Co.)

U. S. Gypsum Co., Chicago, Ill.

Pyrobar Partition and Furring Tile. Booklet, 8½ x 11 ins., 24 pp. Illustrated. Describes use and advantages of hollow tile for inner partitions.

PIPE

American Brass Company, Waterbury, Conn.

Bulletin B-1. Brass Pipe for Water Service. 8½ x 11 ins., 28 pp. Illustrated. Gives schedule of weights and sizes (I.P.S.) of seamless brass and copper pipe, shows typical installations of brass pipe, and gives general discussion of the corrosive effect of water on iron, steel and brass pipe.

American Rolling Mill Company, Middletown, Ohio.

How ARMCO Dredging Products Cut Costs. Booklet, 16 pp., 6 x 9 ins. Data on dredging pipe.

Clow & Sons, James B., 534 S. Franklin St., Chicago, Ill.

Catalog A. 4 x 16½ ins., 700 pp. Illustrated. Shows a full line of steam, gas and water works supplies.

Cohoes Rolling Mill Company, Cohoes, N. Y.

Cohoes Pipe Handbook. Booklet, 40 pp., 5 x 7½ ins. Data on wrought iron pipe.

Duriron Company, Dayton, Ohio.

Duriron Acid, Alkali, Rust-proof Drain Pipe and Fittings. Booklet, 20 pp., 8½ x 11 ins. Illustrated. Important data on a valuable line of pipe.

National Tube Co., Frick Building, Pittsburgh, Pa.

"National" Bulletin No. 2. Corrosion of Hot Water Pipe, 8½ x 11 ins., 24 pp. Illustrated. In this bulletin is summed up the most important research dealing with hot water systems. The text matter consists of seven investigations by authorities on this subject.

"National" Bulletin No. 3. The Protection of Pipe Against Internal Corrosion, 8½ x 11 ins., 20 pp. Illustrated. Discusses various causes of corrosion. and details are given of the deactivating and deareating systems for eliminating or retarding corrosion in hot water supply lines.

"National" Bulletin No. 25. "National" Pipe in Large Buildings. 8½ x 11 ins., 88 pp. This bulletin contains 254 illustrations of prominent buildings of all types, containing "National" Pipe, and considerable engineering data of value to architects, engineers, etc.

Modern Welded Pipe. Book of 88 pp., 8½ x 11 ins., profusely illustrated with halftone and line engravings of the important operations in the manufacture of pipe.

PLASTER

Best Bros. Keene's Cement Co., Medicine Lodge, Kans.

Information Book. Brochure, 24 pp., 5 x 9 ins. Lists grades of plaster manufactured; gives specifications and uses for plaster.

Plasterers' Handbook. Booklet, 16 pp., 3½ x 5½ ins. A small manual for use of plasterers.

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PRATT & LAMBERT-Inc., 122 Tonawanda Street, Buffalo, N. Y. (Phone Delaware 6000); 3301 38th Avenue, Long Island City, N. Y. (Phone Stillwell 5100); 320 West 26th Street, Chicago, Ill. (Phone Victory 1800); In Canada: 34 Courtwright Street, Bridgeburg, Ontario.

"Save the surface and you save all" Paint & Varnish

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 82*

PLASTER—Continued

Interior Walls Everlasting. Brochure, 20 pp., 6¼ x 9¼ ins. Illustrated. Describes origin of Keene's Cement and views of buildings in which it is used.

PLUMBING EQUIPMENT

Clow & Sons, James B., 534 S. Franklin St., Chicago, Ill.

Catalog M. 9¼ x 12 ins., 184 pp. Illustrated. Shows complete line of plumbing fixtures for Schools, Railroads and Industrial Plants.

Crane Company, 836 S. Michigan Ave., Chicago, Ill.

Plumbing Suggestions for Home Builders. Catalog, 3 x 6 ins., 80 pp. Illustrated.

Plumbing Suggestions for Industrial Plants. Catalog, 4 x 6½ ins., 34 pp. Illustrated.

Planning the Small Bathroom. Booklet, 5 x 8 ins. Discusses planning bathrooms of small dimensions.

John Douglas Co., Cincinnati, Ohio.

Douglas Plumbing Fixtures. Bound volume, 200 pp., 8½ x 11 ins. Illustrated. General catalog.

Another Douglas Achievement. Folder, 4 pp., 8½ x 11 ins. Illustrated. Data on new type of stall.

Hospital. Brochure, 60 pp., 8½ x 11 ins. Illustrated. Deals with fixtures for hospitals.

Duriron Company, Dayton, Ohio.

Duriron Acid, Alkali and Rust-Proof Drain Pipe and Fittings. Booklet, 8½ x 11 ins., 20 pp. Full details regarding a valuable form of piping.

Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago, Ill.

Watrous Patent Flush Valves, Duojet Water Closets, Liquid Soap Fixtures, etc. 8½ x 11 ins., 136 pp., loose-leaf catalog, showing roughing-in measurements, etc.

Maddock's Sons Company, Thomas, Trenton, N. J.

Catalog K. 7⅞ x 10⅞ ins., 242 pp. Illustrated. Complete data on vitreous china plumbing fixtures with brief history of Sanitary Pottery.

Speakman Company, Wilmington, Del.

Catalog K. Booklet, 150 pp., 8½ x 10⅞ ins. Illustrated. Data on showers and equipment details.

Trenton Potteries Company, Trenton, N. J.

The Blue Book of Plumbing. Bound volume, 182 pp., 8½ x 10½ ins. Illustrated.

PNEUMATIC TUBE SYSTEMS

G & G Atlas Systems, Inc., 544 West Broadway, New York.

12 pp., 8½ x 11. Illustrated booklet of tube systems for retail stores and other buildings.

4 pp., 8½ x 11. Data Sheet showing schematic diagrams for hotel, bank, factory and wholesale buildings, table of sizes, space requirements and preliminary layout steps. A.I.A. 35h21.

PUMPS

Kewanee Private Utilities Co., 442 Franklin St., Kewanee, Ill.

Bulletin E. 7¾ x 10¼ ins., 32 pp. Illustrated. Catalog. Complete descriptions, with all necessary data, on Standard Service Pumps, Indian Brand Pneumatic Tanks, and Complete Water Systems, as installed by Kewanee Private Utilities Co.

Nash Engineering Company, South Norwalk, Conn.

Bulletin 52 Brochure. 6 pp., 10¾ x 7½ ins. Illustrated in color. Devoted to Jennings Standard Centrifugal Pumps for house service, boosting city water pressure to supply top stories, for circulating warm water, etc.

Bulletin. 97. Booklet. 16 pp., 10¾ x 7½ ins. Illustrated in color. Describes the design, construction and operation of the Jennings Suction Sump Pump.

Bulletin 11. Brochure. 8 pp., 10¾ x 7½ ins. Illustrated in color. Deals with Nash Hytor Vacuum Pumps for air and gases.

The Trane Co., La Crosse, Wis.

Trane Small Centrifugal Pumps. Booklet, 3¾ x 8 ins., 16 pp. Complete data on an important type of pump.

RAMPS

Ramp Buildings Corporation, 21 East 40th St., New York, N. Y.

Building Garages for Profitable Operation. Booklet, 8½ x 11 ins. 16 pp. Illustrated. Discusses the need for modern mid-city, parking garages, and describes the d'Humy Motoramp system of design, on the basis of its superior space economy and features of operating convenience. Gives cost analyses of garages of different sizes, and calculates probable earnings.

Garage Design Data. Series of informal bulletins issued in loose-leaf form, with monthly supplements.

REFRIGERATION

The Fulton Syphon Company, Knoxville, Tenn.

Temperature Control of Refrigeration Systems. Booklet, 8 pp., 8½ x 11 ins. Illustrated. Deals with cold storage, chilling of water, etc.

North Western Expanded Metal Company, Chicago, Ill.

Designing Data. Book, 6 x 9 ins., 96 pp. Illustrated. Covers the use of Econo Expanded Metal for various types of reinforced concrete construction.

REINFORCED CONCRETE—See also Construction, Concrete

Longspan ¾-inch Rib Lath. Folder, 4 pp., 8½ x 11 ins. Illustrated. Deals with a new type of V-Rib expanded metal.

Truscon Steel Company, Youngstown, Ohio.

Shearing Stresses in Reinforced Concrete Beams. Booklet, 8½ x 11 ins., 12 pp.

RESTAURANT EQUIPMENT

John Van Range Company, Cincinnati.

Planning Restaurants That Make Money. Booklet, 78 pp., 8½ x 11 ins. Illustrated. Excellent work on equipment.

ROOFING

The Barrett Company, 40 Rector St., New York City.

Architects' and Engineers' Built-up Roofing Reference Series; Volume IV Roof Drainage System. Brochure, 64 pp., 8½ x 11¼ ins. Gives complete data and specifications for many details of roofing.

Federal Cement Tile Co., 608 S. Dearborn Street, Chicago.

Catalog and Roof Standards. Booklet, 36 pp. 8½ x 11 ins. Illustrated. Describes Featherweight Concrete Insulating Roof Slabs, including complete data, weights and dimensions, specifications and detail drawings. Also includes complete information on Featherweight Nailing Concrete Roof Slabs for use with ornamented slate or copper covering. The catalog is profusely illustrated and contains also a partial list of users.

Examples of Theaters and Theater Roofs. Brochure, 16 pps., 8½ x 11 ins., Illustrated. Contains views of theaters designed by some of the country's leading architects.

Federal Interlocking Tile and Glass Tile. 4 pp., 8½ x 11 ins. Illustrates and describes complete roof or precast concrete slabs requiring no composition covering.

Heinz Roofing Tile Co., 1925 West Third Avenue, Denver, Colo.

Plymouth-Shingle Tile with Sprocket Hips. Leaflet, 8½ x 11 ins. Illustrated. Shows use of English shingle tile with special hips.

Italian Promenade Floor Tile. Folder, 2 pp., 8½ x 11 ins. Illustrated. Floor tiling adapted from that of Davanzati Palace.

Mission Tile. Leaflet, 8½ x 11 ins. Illustrated. Tile such as are used in Italy and Southern California.

Georgian Tile. Leaflet, 8½ x 11 ins. Illustrated. Tiling as used in old English and French farmhouses.

Johns-Manville Corporation, New York.

The New Book of Roofs. Brochure, 24 pp., 8½ x 11 ins. Illustrated. Roofing from the Architect's point of view.

Ludowici-Celadon Company, 104 So. Michigan Ave., Chicago, Ill.

"Ancient" Tapered Mission Tiles. Leaflet, 8½ x 11 ins., 4 pp. Illustrated. For architects who desire something out of the ordinary this leaflet has been prepared. Describes briefly the "Ancient" Tapered Mission Tiles, hand-made with full corners and designed to be applied with irregular exposures.

Milwaukee Corrugating Co., Milwaukee.

Milcor Architectural Sheet Metal Guide. Booklet. 72 pp., 8½ x 11 ins. Illustrated. Metal tile roofing, skylights, ventilators, etc.

Milcor Sheet Metal Handbook. Brochure. 128 pp., 8½ x 11 ins. Illustrated. Deals with rain-carrying equipment, etc.

Structural Gypsum Corporation, Linden, N. J.

Relative Effectiveness of Various Types of Roofing Construction in Preventing Condensation of the Under Surface. Folder, 4 pp., 8¾ x 11 ins. Important data on the subject.

Gypsteel Pre-cast Fireproof Roofs. Booklet, 48 pp., 8½ x 11 ins. Illustrated. Information regarding a valuable type of roofing.

U. S. Gypsum Co., Chicago, Ill.

Pyrobar Roof Construction. Booklet, 8 x 11 ins., 48 pp. Illustrated. Gives valuable data on the use of tile in roof construction.

Sheetrock Pyrofill Roof Construction. Folder, 8½ x 11 ins. Illustrated. Covers use of roof surfacing which is poured in place.

SCHOOL EQUIPMENT

John Van Range Co., Cincinnati.

Practical Planning for School Service. Booklet, 32 pp., 8½ x 11 ins. Illustrated.

SEWAGE DISPOSAL

Kewanee Private Utilities, 442 Franklin St., Kewanee, Ill.

Specification Sheets. 7¾ x 10¼ ins., 40 pp. Illustrated. Detailed drawings and specifications covering water supply and sewage disposal systems.

Nash Engineering Company, South Norwalk, Conn.

Bulletin 67. Booklet. 16 pp. 10¾ x 7½ ins. Illustrated in color. Describes Type A Jennings Sewage Ejector for handling Unscreened sewage and raising it from basements below sewer level.

Bulletin 103. Brochure. 16 pp. 10¾ x 7½ ins. Illustrated in color. Deals with small size Type B Jennings Sewage Ejector.

SCREENS

American Brass Co., The, Waterbury, Conn.

Facts for Architects About Screening. Illustrated folder, 9½ x 11¾ ins., giving actual samples of metal screen cloth and data on fly screens and screen doors.

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Dance Floor in the Silver Slipper Night Club, Memphis Laid by R. Cluck Flooring Co., Memphis

*Embassy Club—Toronto, Canada. Approximately 2500 square feet oak *CELLized Floor Blocks. Jonckheere Construction Co., Contractors.*

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THE LONG-BELL LUMBER CO.	Kansas City, Mo.
NASHVILLE HDW. FLOORING CO.	Nashville, Tenn.
ARKANSAS OAK FLOORING CO.	Pine Bluff, Ark.

***CELLized Oak Flooring Inc.**

MEMPHIS — TENNESSEE

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 84*

SCREENS—Continued

Athey Company, 6015 West 65th St., Chicago, Ill.
The Athey Perennial Window Shade. An accordion pleated window shade, made from translucent Herringbone woven Coutil cloth, which raises from the bottom and lowers from the top. It eliminates awnings, affords ventilation, can be dry-cleaned and will wear indefinitely.

Orange Screen Co., Maplewood, N. J.
Orsco Aluminum Screens. Booklet, 8 pp., 8 x 11 ins. Illustrated. Data on a valuable line of screens.

Orsco Screens and Other Products. Brochure, 20 pp., 8 x 11 ins. Illustrated. Door and window screens and other hardware.

SHADE CLOTH AND ROLLERS

Columbia Mills, Inc., 225 Fifth Avenue, New York, N. Y.
Window Shade Data Book. Folder, 28 pp., 8½ x 11 ins. Illustrated.

SHELVING-STEEL

David Lupton's Sons Company, Philadelphia, Pa.
Lupton Steel Shelving. Catalog E. Illustrated brochure, 40 pp., 8⅝ x 11 ins. Deals with steel cabinets, shelving, racks, doors, partitions, etc.

STEEL PRODUCTS FOR BUILDING

Bethlehem Steel Company, Bethlehem, Pa.
Steel Joists and Stanchions. Booklet, 72 pp., 4 x 6¾ ins. Data for steel for dwellings, apartment houses, etc.

Steel Frame House Company, Pittsburgh, Pa. (Subsidiary of McClintic-Marshall Corp.)
Steel Framing for Dwellings. Booklet, 16 pp., 8½ x 11 ins. Illustrated.

Steel Framing for Gasoline Service Stations. Brochure, 8 pp., 8½ x 11 ins. Illustrated.

Steel Frame Standard Gasoline Service Stations. Booklet, 8 pp., 8½ x 11 ins. Illustrated. Three standard designs of stations.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
The Arc Welding of Structural Steel. Brochure, 32 pp., 8½ x 11 ins. Illustrated. Deals with an important structural process.

STONE, BUILDING

Indiana Limestone Company, Bedford, Ind.
Volume 3, Series A-3. Standard Specifications for Cut Indiana Limestone work, 8½ x 11 ins., 56 pp. Containing specifications and supplementary data relating to the best methods of specifying and using this stone for all building purposes.

Volume 1. Series B. Indiana Limestone Library, 6 x 9 ins., 36 pp. Illustrated. Giving general information regarding Indiana Limestone, its physical characteristics, etc.

Volume 4. Series B. Booklet. New Edition, 8½ x 11 ins., 64 pp. Illustrated. Indiana Limestone as used in Banks.

Volume 5. Series B. Indiana Limestone Library. Portfolio, 11⅛ x 8¾ ins. Illustrated. Describes and illustrates the use of stone for small houses with floor plans of each.

Volume 6. Series B. Indiana Limestone School and College Buildings. 8½ x 11 ins., 80 pp. Illustrated.

Volume 12. Series B. Distinctive Homes of Indiana Limestone. 8½ x 11 ins., 48 pp. Illustrated.

Old Gothic Random Ashlar. 8½ x 11 ins., 16 pp. Illustrated.

STORE FRONTS

Brasco Manufacturing Co., 5025-35 South Wabash Ave., Chicago, Ill.
Catalog No. 33. Series 500. All-Metal Construction. Brochure, 20 pp., 8½ x 11 ins. Illustrated. Deals with store fronts of a high class.

Catalog No. 34. Series 202. Standard construction. Booklet, 16 pp. 8½ x 11 ins. Illustrated, complete data on an important type of building.

Detail Sheets. Set of seven sheets, 8½ x 11 ins., printed on tracing paper, giving full-sized details and suggestions for store front designs.

Davis Solid Architectural Bronze Sash. Set of six sheets, 8½ x 11 ins., printed on tracing paper. Full-sized details and suggestions for designs of special bronze store front construction.

The Kawneer Company, Niles, Mich.
Catalog M, 1929 Edition, 64 pages, 8½ x 11 ins., with the A.I.A. File No., profusely illustrated. General Catalog.
Detail Sheet and descriptive folder, 8½ x 11 ins., with A.I.A. File No. featuring "B" Store Front Construction, designed along modernistic lines.

STORE FRONTS—Continued

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C. Pardee Works, 9 East 45th St., New York, N. Y., and 1600 Walnut St., Philadelphia, Pa.
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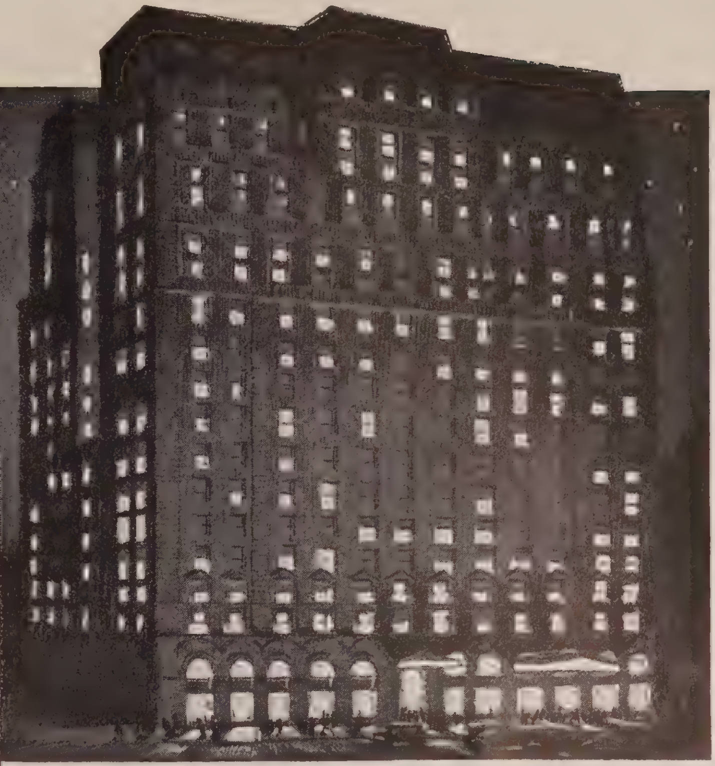
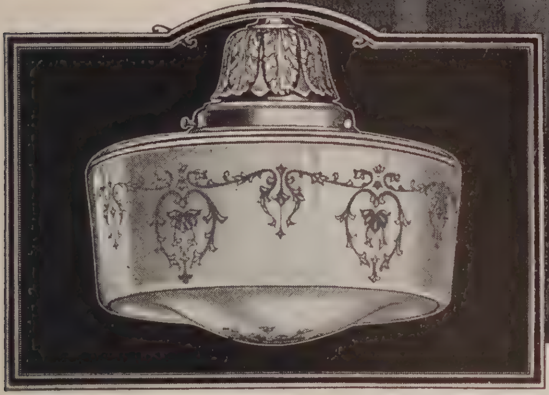


Paramount Hotel, New York. Thomas W. Lamb, Arch.



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Lupton Commercial Projected Windows. Brochure. 24 pp., 8½ x 11 ins. Illustrated. Details and specifications.

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National Lumber Mfrs. Assn., Washington, D. C.
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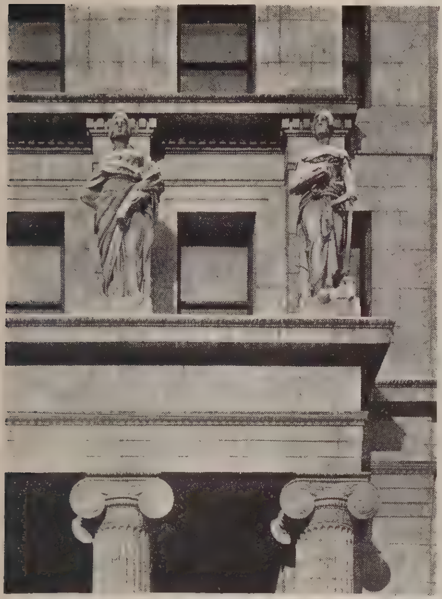
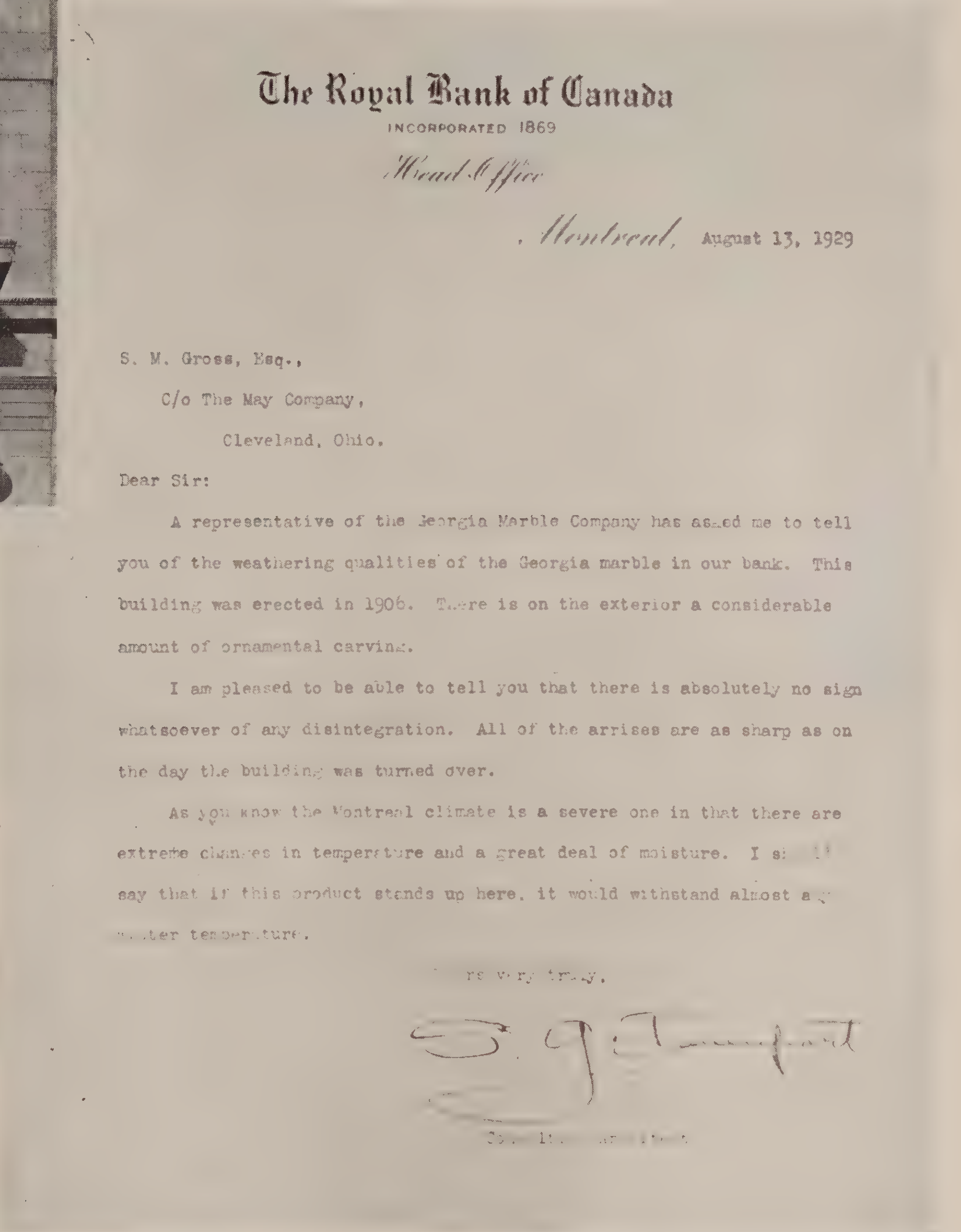


Detail of facade of the old building of The Royal Bank of Canada, Montreal. Now occupied by the Banque Provinciale du Canada; Howard Colton Stone, *Architect.*

This photograph, taken in the winter, shows a deposit of snow on the carved figures.

22 Canadian Winters



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INCORPORATED 1869
Head Office

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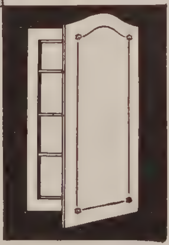

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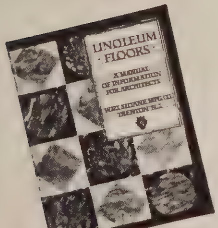

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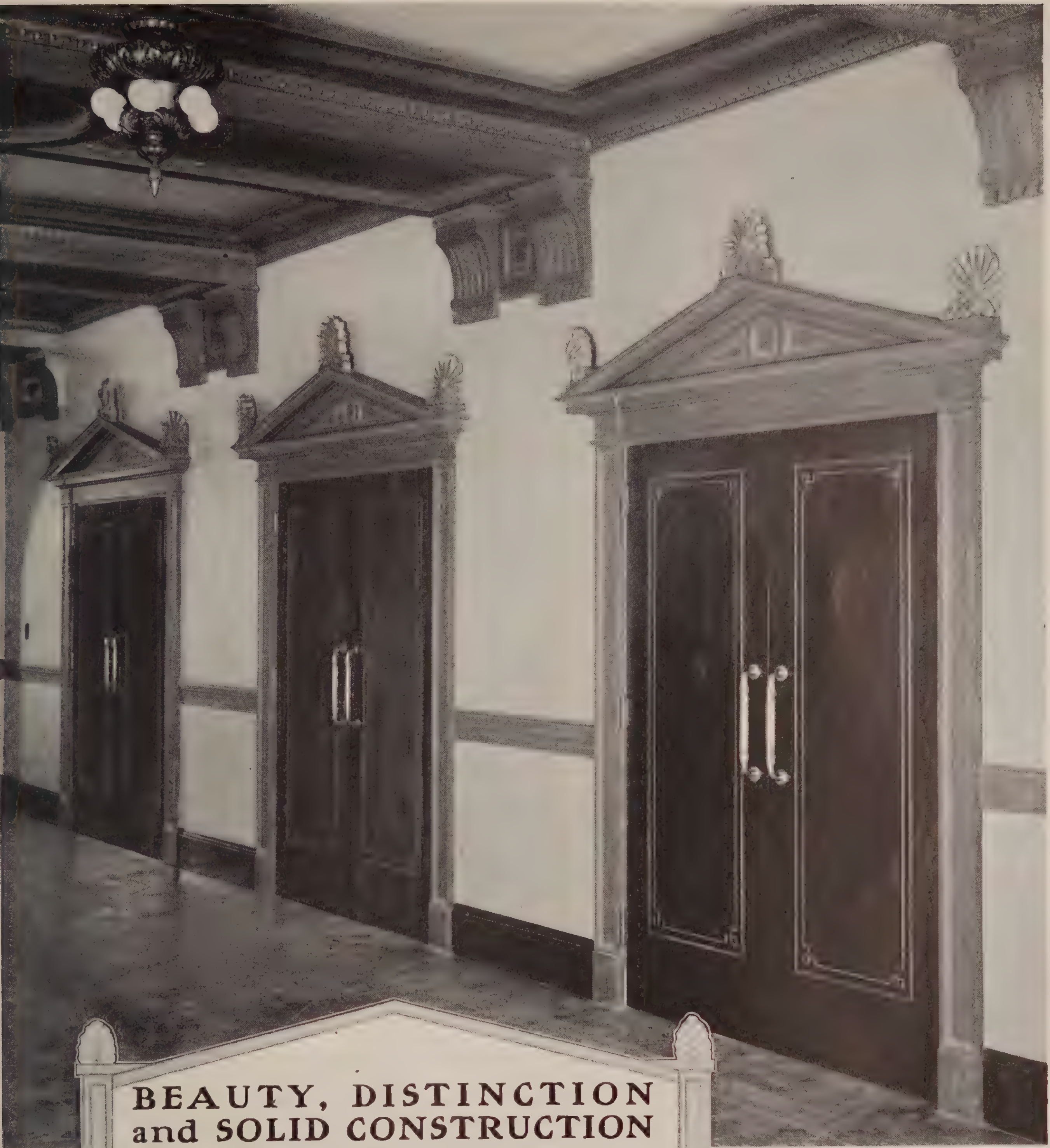

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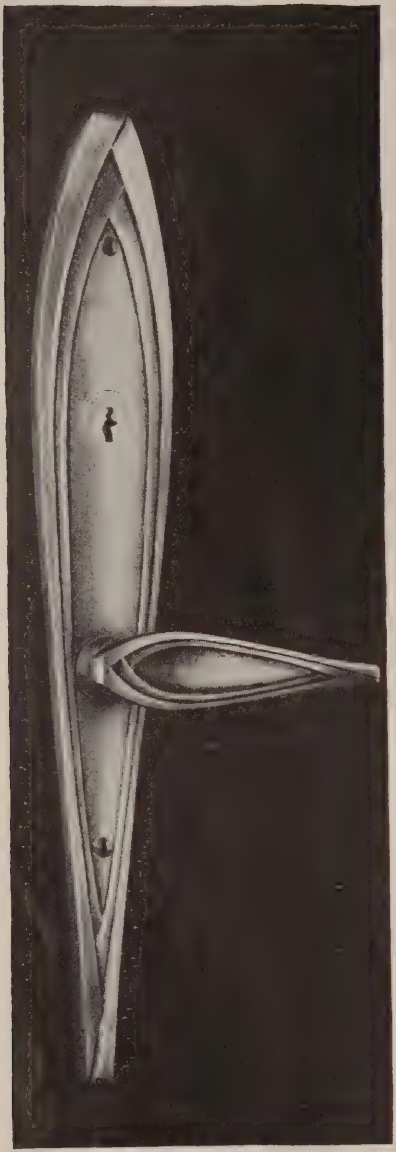

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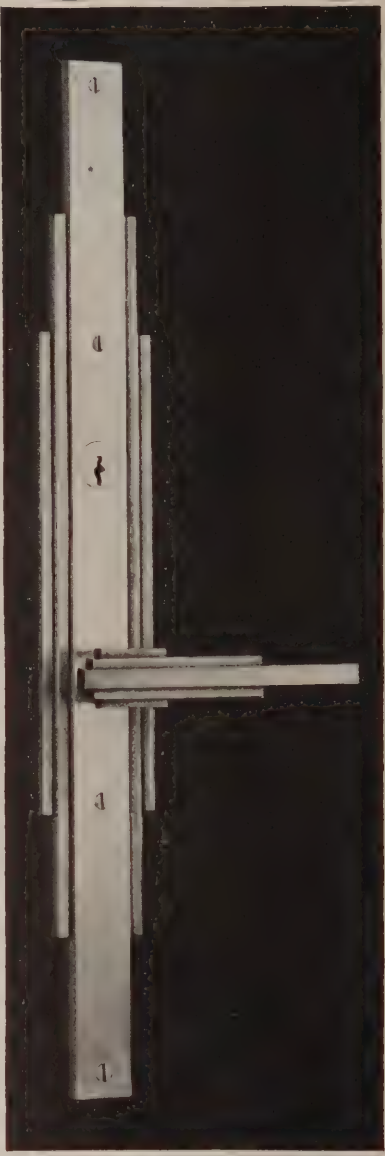

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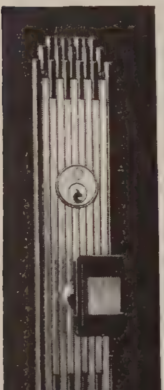

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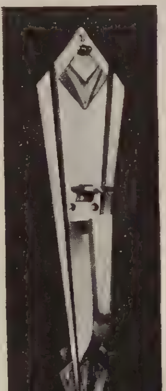

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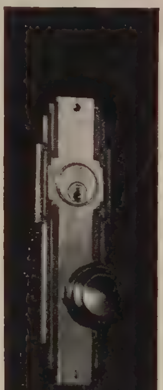

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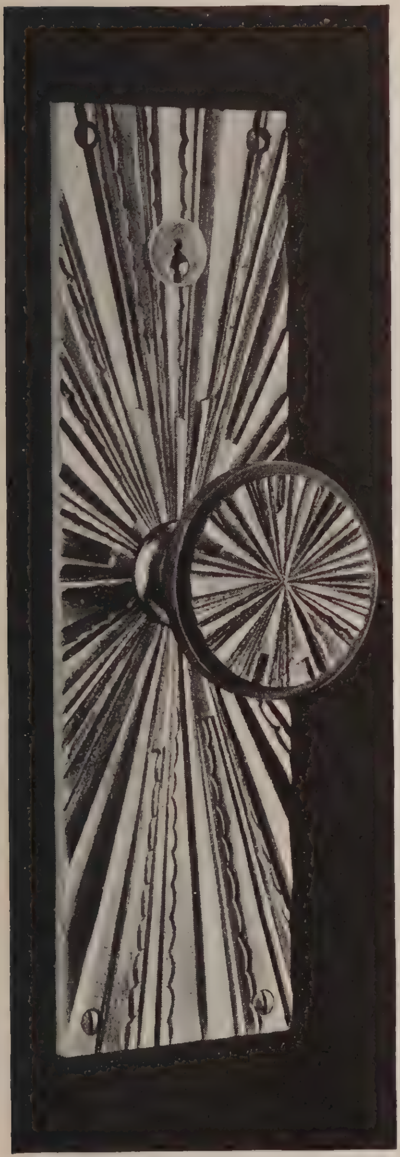

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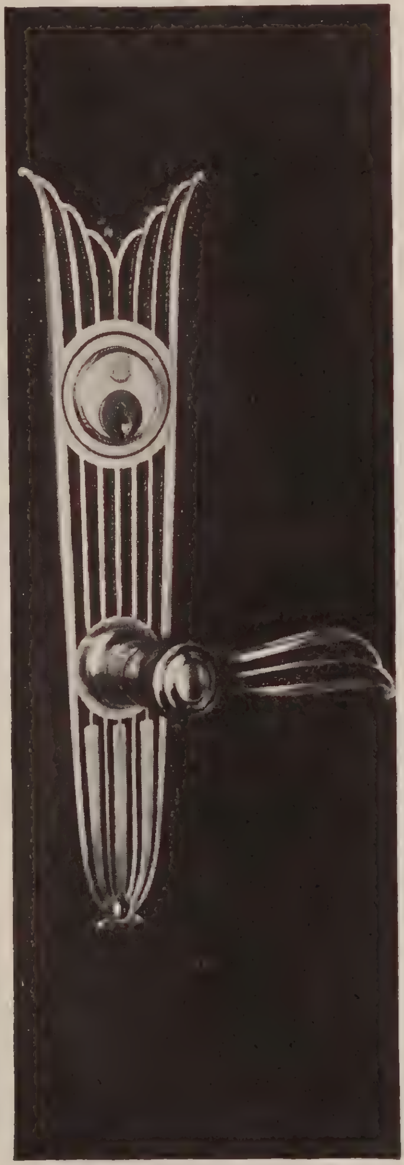

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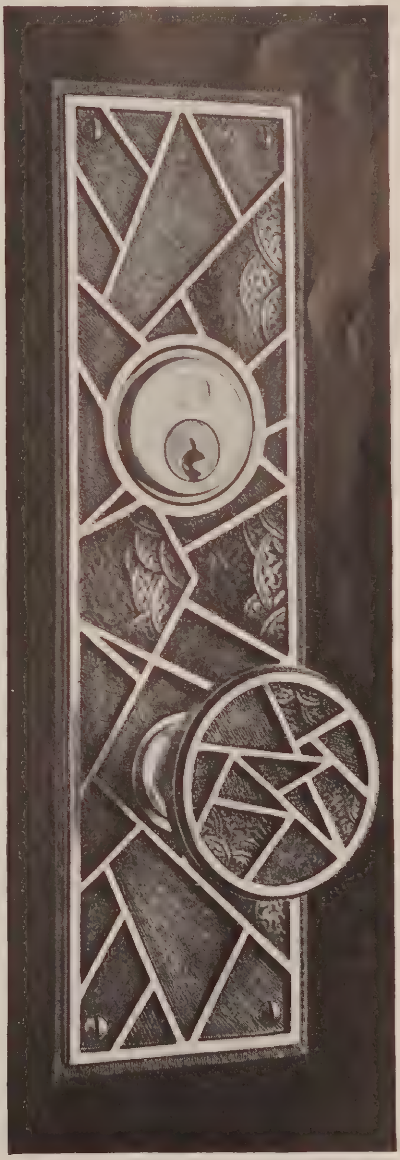

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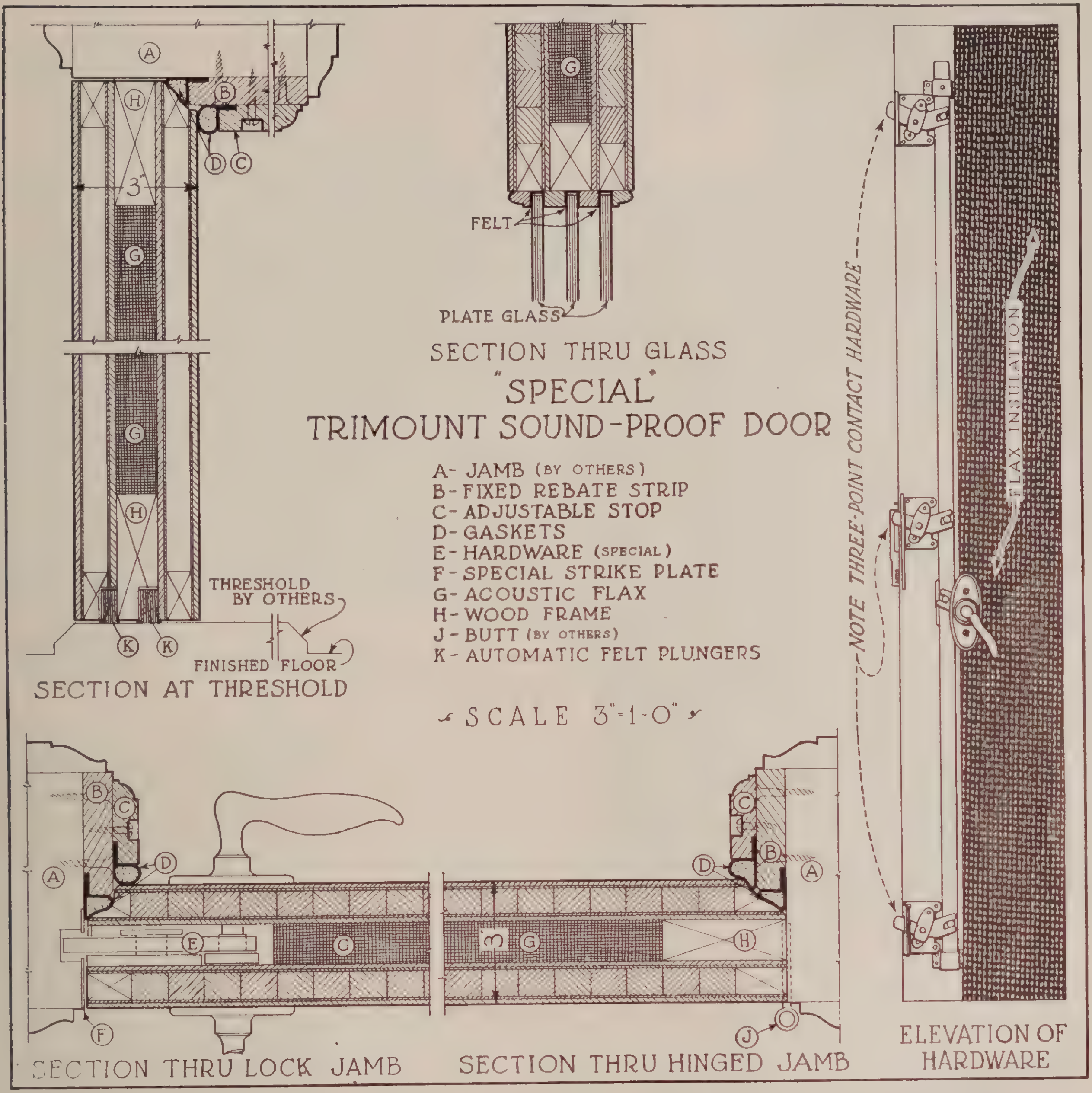

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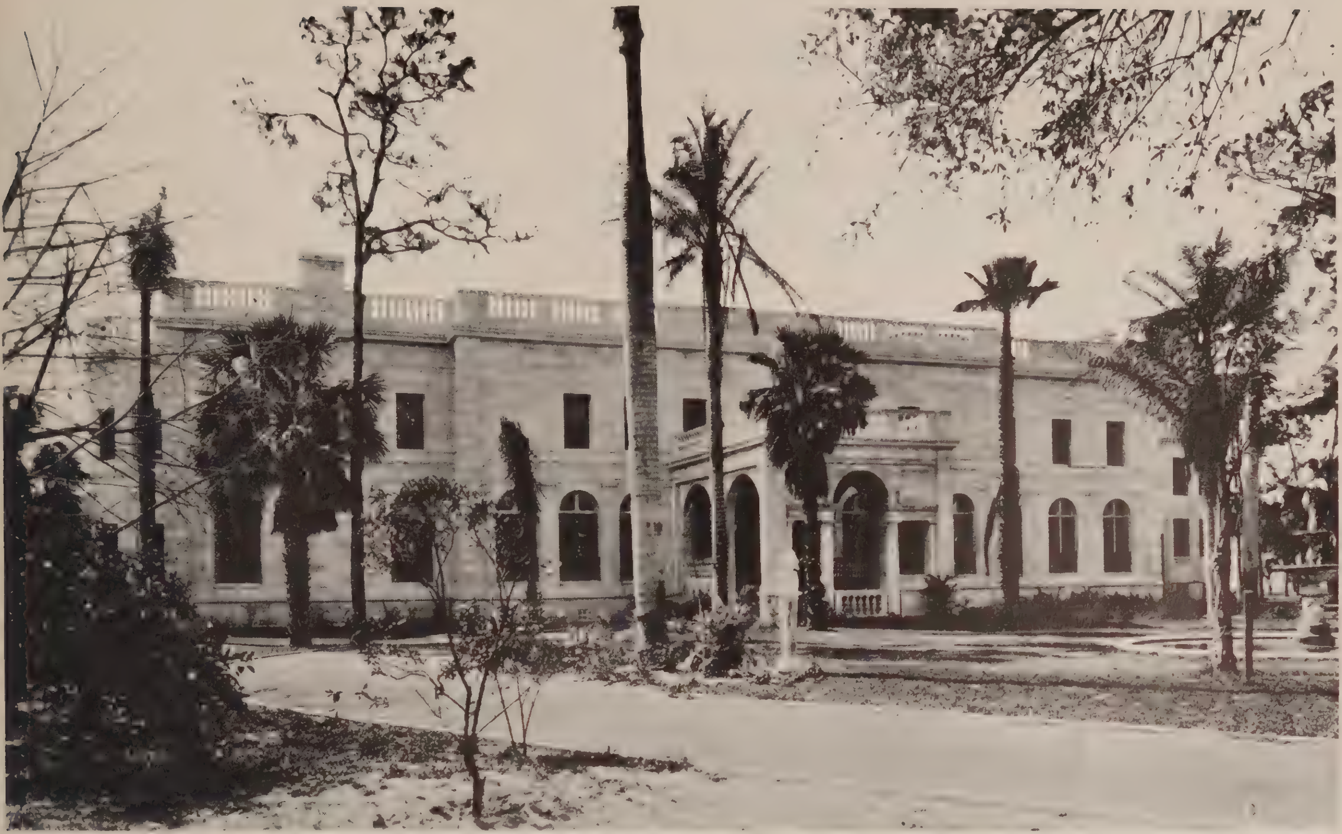

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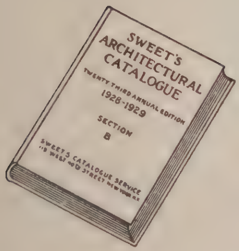

See pages 2519-2598 for a listing of Russwin Hardware

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REVIEWS OF MANUFACTURERS' PUBLICATIONS

WHITEHEAD & KALES COMPANY, Detroit. "Vaporflo." Important data on supplying humidity in the home.

When the temperature outside of the house is at zero, the air can hold only half a grain of moisture per cubic foot. This air, when warmed, permeates the house. When its temperature has been raised by the heating plant to 70°, the air can carry eight grains of moisture per cubic foot or 16 times the amount that it actually was carrying. The air in the house is thirsty, so thirsty that it will rob the moisture from respiratory organs and steal natural oils from hands, face and hair. Excessive evaporation chills the body and lowers resistance to disease. This very interesting folder describes "Vaporflo" a household humidifying device. Vaporflo is a compact device adapted for installation on steam, hot water, vapor vacuum, and warm air furnaces. It is claimed to be easily installed by any plumber and provides a constant supply of sterile water vapor which, during the operation of the heater, permeates the air and supplies the necessary moisture without attention on the part of the householder.

SAMUEL CABOT, INC., 141 Milk Street, Boston. "Cabot's Creosote Shingle Stains." Some data on their manufacture.

There are certain types of residence structures which are never so attractive as when their outer walls as well as their roofs are covered with shingles. This is especially true of some of the early American architectural types developed on Cape Cod and in some other parts of New England, where many old shingled houses are still leading a useful existence. This booklet goes quite fully into describing the production of the widely known Cabot's Creosote Stained Shingles,—their being dried in kilns after being cut from giant red cedars felled in the forests of Oregon, Washington and British Columbia. From these trees are made the edge-grain shingles,—"XXXXXX," "Perfections," and "Royals,"—that are used exclusively for Cabot's Creosote Stained Shingles. "These trees have reached maturity and should be cut to make room for growing trees, and advanced methods of forestry now in use insure that these great forests will furnish a perpetual supply. They are the best shingles ever made. No such lumber ever existed in the east, and no shingles ever made before will lay as well, look as well or last as long as these red cedars. Remembering the splendid wearing qualities of the eastern white cedar shingles, where the timber made edge-grain production impossible, it is easy to see why these shingles will greatly outlast them. The wonderful straight-grained lumber from these giant trees has made it possible to produce the 24-inch shingles (Royals) which have become so popular for walls. Laid with an exposure of 8 or 10 inches to the weather they are much more picturesque than wide clapboards or siding, make a warmer covering for the house, and Cabot's 24-inch Stained Shingles are actually cheaper in first cost and maintenance than painted clapboards." Quite naturally, the brochure deals with the creosote stains which have made the name of Cabot famous. "Cabot's Stains were invented by a chemist. Every ingredient and process in the manufacture of these stains have always been scientifically selected and executed under control of a chemical laboratory. Every ingredient has a distinct value for its purpose and benefits the wood. The colors are all pigment colors, the strongest and purest made and the most durable. They are colloidally compounded by the Cabot Collopaking Process,—the latest achievement in the development of color compounding,—which reduces the pigments to sub-microscopic fineness, so that they have the transparency and the penetrating power of dyes combined with greater durability than paints. They are mixed with our own specially refined Cabot's creosote, which we distill from the original tar and refine for our own uses. The stains contain no thinners, no kerosene, benzine, or other product of petroleum, fillers or other cheapeners, and to this fact in connection with the strength and purity of their colors are due the unequaled depth and richness of the Cabot's stain colors. All other shingle stains look painty in comparison with Cabot's, and while the Cabot colors retain their richness and life after exposure, these painty colors quickly grow dull and lifeless. Kerosene and benzine stains are dangerously inflammable. Cabot's stains reduce the inflammability of wood."

COMMONWEALTH EDISON COMPANY, Chicago. "Electricity for Industrial Heating." Its increasingly rapid growth.

There was a time when the activities of man were measured by the span of daylight. Night meant a cessation of practically all human labor. How different it is today! Switches are closed and the villages, towns, and cities of the nation press back the walls of darkness with floods of brilliant light. Man is freed from his age-old conqueror. Next came the electricity that holds compact in its comparatively small frame the power of slaves or massive engines. The same electricity now starts great factories into life and drives machines that are the equal of millions of human hands and backs. The last great feat of this remarkable form of energy is the replacement of many other heat sources in industrial manufacture. This latest use has grown with the same rapidity as the other two. Industries can now boast of thousands of successful applications of electrical heat, with more new uses being added every day. Our dreams of an electrical world are coming true. This very interesting booklet will give one full knowledge of its use.

COLUMBIA MILLS, INC., 225 Fifth Ave., New York. "Window Shades." A booklet with practical data on their use.

The appearance of a building of any sort or size is considerably affected by its window shades. The selection of a color seems to be largely a matter of taste, one school of architects and decorators holding that the shades should match in color that of the exterior walls, while another school maintains that a desirable contrast in colors should be aimed at. All agree, however, that all the windows of a building,—windows small and windows large,—should be hung with shades of the same material and color in order to give the structure a certain symmetry and dignity; apartment house owners, in fact, often forbid their tenants to use, at least as exterior shades, anything other than those of a certain material of a certain color. This brochure deals with the excellent assortment of window shade material manufactured by the well known Columbia Mills. The booklet gives actual samples of a number of shade fabrics, and it illustrates and lists the wide variety of rollers, brackets, etc., which are required for their installation. It also gives complete directions for measuring for shades and preparing specifications where very extensive installations are required. The brochure also contains illustrations of a great variety of buildings, large and small, in different cities, in which shades of material from the Columbia Mills are being used.

BLISS STEEL PRODUCTS CORPORATION, East Syracuse, N. Y. "Bliss Steel Windows and Doors."

So much has been written during recent years regarding new and improved types of windows,—windows which alone often make buildings of certain kinds possible,—that architects, engineers and builders may now probably be considered "sold." But there still remains something to be done to convert or convince certain of the laity, and to this end considerable missionary work is being done by the manufacturers of windows. This booklet, evidently planned not for the laity but for architects and engineers, pre-supposes a fair knowledge of windows appropriate for use in such large structures as industrial and manufacturing buildings, buildings of different kinds for the automobile industry, theaters, etc. The brochure fully illustrates the windows, gives data regarding their sizes and the proper methods of manipulating them, and it also gives views of many buildings of different sorts in which Bliss Steel Windows are being used; it also gives data regarding steel doors, particularly large doors much used in garages, power houses and other structures of a more or less similar character. The brochure has been carefully written and well edited, and the arrangement of the data is such that all the necessary details of a window are had by merely glancing at the pages which deal with the particular type under consideration.

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FRANCIS A. NELSON, Architect

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REVIEWS OF MANUFACTURERS' PUBLICATIONS

JOHNS-MANVILLE CORPORATION, 292 Madison Avenue, New York. "J-M Bonded Built-up Asbestos Roofs."

It can readily be seen that no part of a building is more important than its roof, the function of which is to protect the interior of the building and its contents from the weather. The importance of roofs has led to their receiving careful study at the hands of architects, engineers, builders and the research staffs of large manufacturers, and there have been placed upon the market a wide variety of roofs suited to buildings of a great diversity of types. This brochure, one of a large number issued by the Johns-Manville Corporation, deals with the "J-M Bonded Built-up Asbestos Roof," so called because its wearing qualities are guaranteed or backed up by bonds of the National Surety Company for 10, 15 or 20 years depending upon the type of the roof chosen. Thus there is given to the owner of such a roof positive assurance that during the time specified he will be put to no expenditure for repairs or maintenance. "Perfect materials, applied by trained artisans under J-M supervision and inspection go into every J-M bonded roof. J-M asbestos roofs are built up from alternate layers of asbestos felt and melted J-M asphalt roofing cement. The number of alternate layers of materials determines the grade or classification of the roof. The top finish is a smooth, clean surface of asphalt. Good roofing materials must be applied only by skilled workmen in order to secure a finished roof that measures up completely to the high caliber of the products themselves. Realizing the importance of this element in roofing service, Johns-Manville has established the practice of having J-M bonded roofs laid solely by J-M approved roofers. In each locality, Johns-Manville has selected and given a special franchise to an outstanding roofing contractor who has demonstrated his integrity, workmanlike efficiency and conformity to standards."

THE JOHN VAN RANGE CO., Cincinnati. "Practical Planning for Church Food Service." A useful brochure.

A considerable part of the religious world is finding that the maintenance of church organizations is coming to depend more and more upon the strength of the institutional service and the extent of encouragement to what might perhaps be called "community spirit" a congregation is prepared to give. For more than 40 years architects have been gradually expanding the size of church plants to keep pace with their constantly widening scope of activity. To the "Sunday School room" there was presently added a "church parlor," both to be merged presently in the "parish house," and the parish house gradually came to include a gymnasium, swimming pool and library, in fact almost everything which would be expected of a residence Y.M.C.A. or Y.W.C.A. excepting living quarters. Along with all this there went the development of culinary departments, also gradually expanding until the tiny and rather primitive kitchen where the ladies of the congregation presided when an "oyster supper" was in progress or a "strawberry festival" was being celebrated was developed into a full-fledged kitchen almost if not quite as complete as that of a restaurant or a hotel and manned, as likely as not, by attendants trained and skilled in a department devoted to cooking upon a goodly scale.

This brochure, one of a series being issued by the well known John Van Range Co., a subsidiary of the Albert Pick-Barth Company, Inc., traces the growth of the departments of a church plant devoted to cooking and the serving of meals and analyzes their needs. What is more, it suggests the best means of meeting the needs of the situation with planning which shall be adequate and yet economical. This of course is quite important to an architect dealing with the designing and planning of a church group, and yet because such commissions are not numerous and their problems need not be frequently solved, neither the architect nor his principal assistants may be able to give the matter the study it really deserves. The brochure, extremely well and carefully written, is made even more helpful and complete by the inclusion of many plans of church premises which entail kitchens and pantries or serving rooms as well as restaurants or cafeterias in addition to most of the other departments likely to be had. Views of the interiors of well planned kitchens and serving rooms suggest arrangements.

MIDWEST AIR FILTERS, INC., Bradford, Pa. "Easy Calculator for Determining Air Filter Sizes."

The convenience of specification writers will be served by an ingenious little device being distributed by the Midwest Air Filters, Inc. This is a calculator by which one may quickly find the size of an air filter when the c.f.m. rate is known. A dial being turned about brings the capacity figure into view, when just below there appear other figures giving the width, height and depth of the filter necessary. Any specification writer who desires one of the "calculators" can no doubt secure it by addressing the Midwest Filters, Inc.

DETROIT STEEL PRODUCTS COMPANY, Detroit. "Fenestra Hangar Doors and Windows." Data on their use.

The rapid growth of aviation in all its forms gives particular interest on the part of architects, engineers and builders to the buildings necessary for use in connection with aëronautics. This brochure is issued by a firm which has made a long and extremely successful study of steel doors and windows of different types, and this particular publication deals with the firm's line of Fenestra hangar doors, which obviously must be of far greater sizes than doors intended for use in buildings of other types. "Fenestra Airplane Hangar Doors are made in two types and three standard sizes. The two types are 'Straight Sliding Doors' and 'Round-the-Corner Doors.' The standard sizes are 10 feet wide by 18, 20 and 22 feet high. Construction details and hardware are identical on all doors with the exception of the operating rollers on which the doors rest. These are swiveled on the Round-the-Corner Doors. Leading architects and engineers, who are authorities on airport construction, say that in addition to providing a clear opening a satisfactory door must be: 1. Fireproof; 2. Easy to operate, manually; 3. Weathertight; 4. Daylighted; 5. Rigid; 6. Free from warpage; 7. Neat in appearance; 8. Economical to maintain. Fenestra Hangar Doors are designed to meet all of the requirements and to be in harmony with the most modern and efficient types of construction." The brochure gives illustrations of the exteriors and interiors of quite a number of well designed hangars in different parts of the country which are equipped with Fenestra doors.

NATIONAL STEEL FABRIC CO., Pittsburgh. "Steeltex Specified in All Steel Frame Homes."

The qualities of steel construction which alone have made possible the towering buildings,—the "skyscrapers" of American cities,—are not only the strength of steel which makes these buildings possible and the slenderness of construction which this great strength renders practicable. Another quality is the rigidity of steel and its not being subject (at least in any considerable degree) to the swelling and contraction encountered where wood is used, this swelling and contraction usually involving the cracking and sometimes the failing of plaster which is applied upon wood. The application of the "steel construction" principle is now universal for tall buildings and is often used for structures of certain types which are not tall, and the same benefits are now being made use of in the building of residences, and even of residences of small extent. This folder illustrates just this. Under a view of a building fully framed in steel it says: "Here is a typical steel-frame house under construction. Fabricated steel construction units make possible a rigid strength in framework impossible to obtain with ordinary materials,—skyscraper construction successfully applied to modern home building. When complete, the exterior and interior of this house will be reinforced with strong Steeltex. Steeltex is efficiently used in all forms of construction, no matter what the building material or construction type may be." Other pages of the folder show the use of "Steeltex" as a base for exterior stucco and interior plaster, and likewise used for the construction of floors, all this giving moisture-proof, sound-deadening insulation besides adding great strength and shock-resisting qualities that would be otherwise impossible. "In modern garage floors or cellar floors, wherever great strength and endurance are essential, Steeltex is definitely the accepted modern material."

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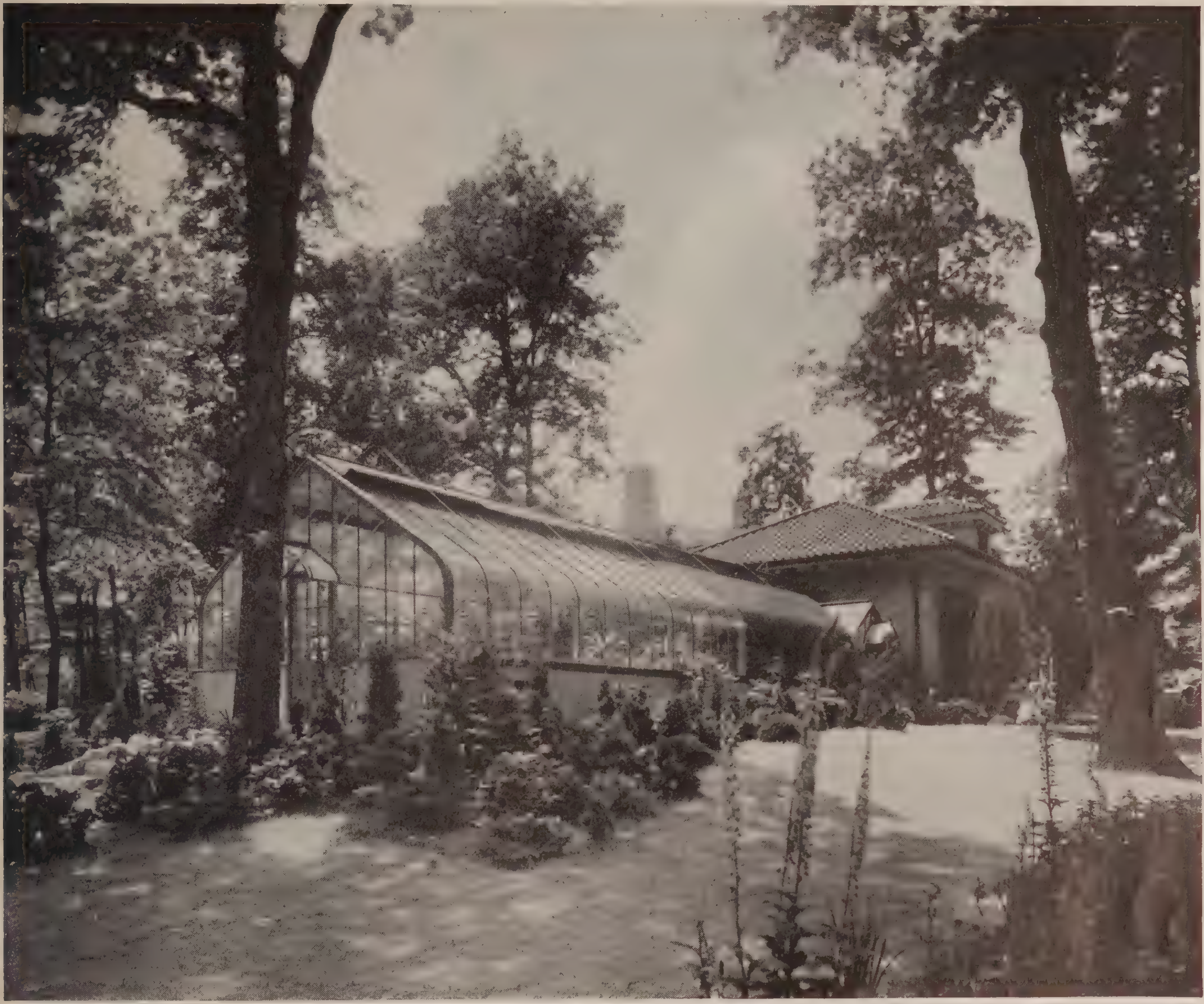

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Either from photographs we show you, or from an actual view of houses we will take you to, your sense of beauty and proportion will tell you what really lovely things Lutton Solar V-Bar greenhouses are . . . Then from a careful comparison of specifications, a point by point analysis of structural detail, and a study of our list of customers, your business sense will tell you that here must be beauty deeper than the beauty you see. A letter will bring a catalogue and any specific information you request.

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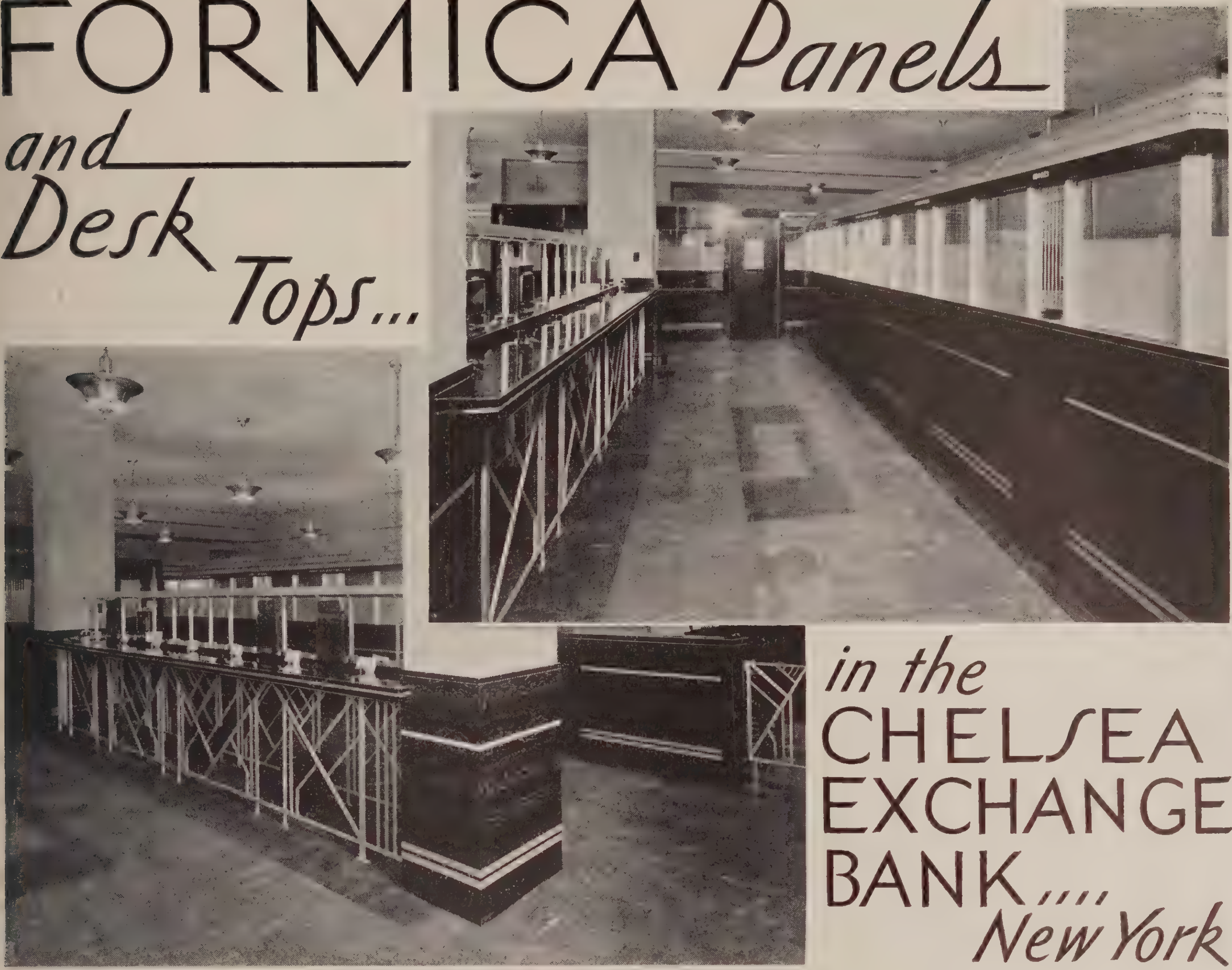

in the CHELSEA EXCHANGE BANK.... *New York*

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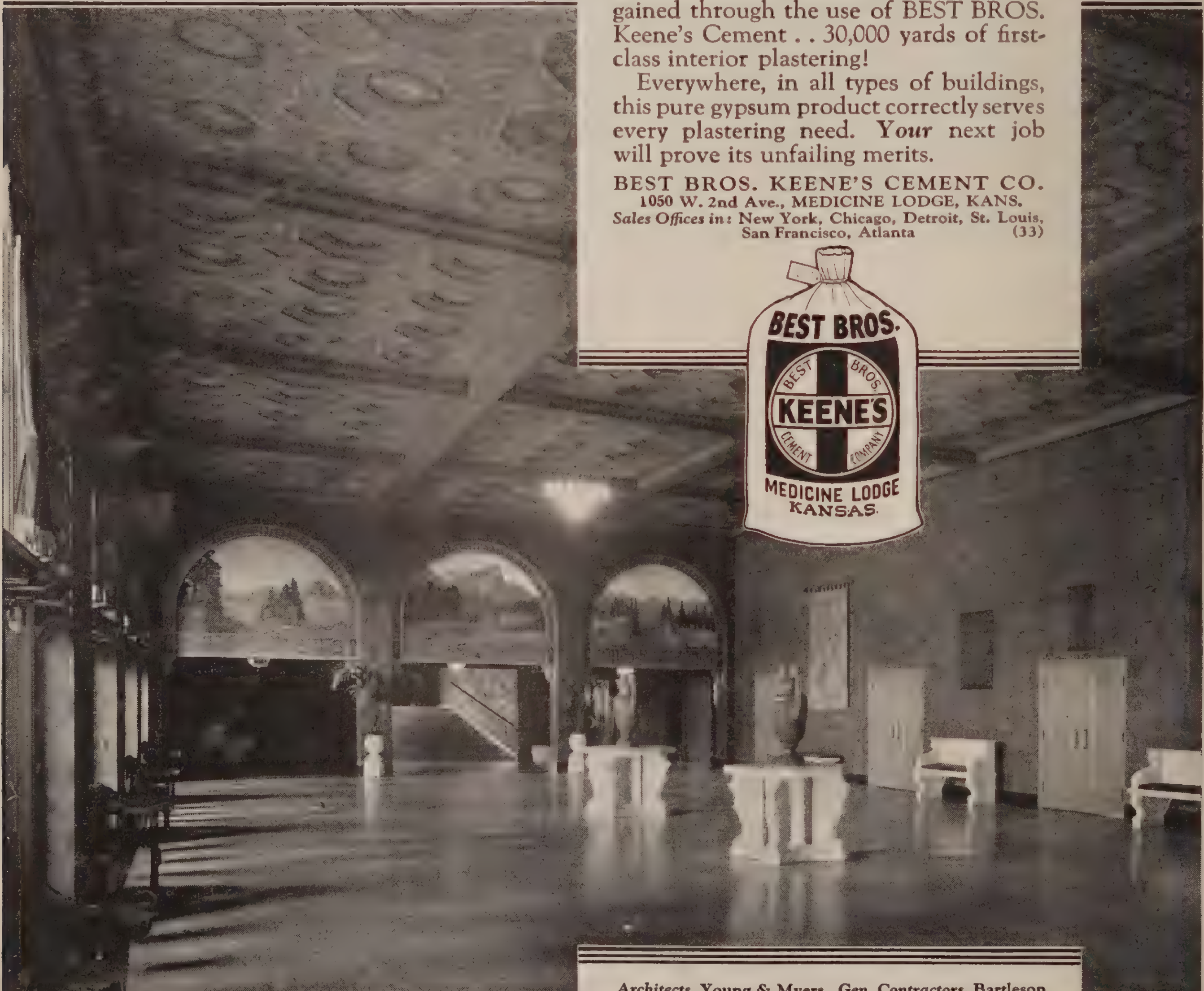

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IN TWO PARTS

ARCHITECTURAL ENGINEERING
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PART TWO

DECEMBER

1929

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PRICE $3

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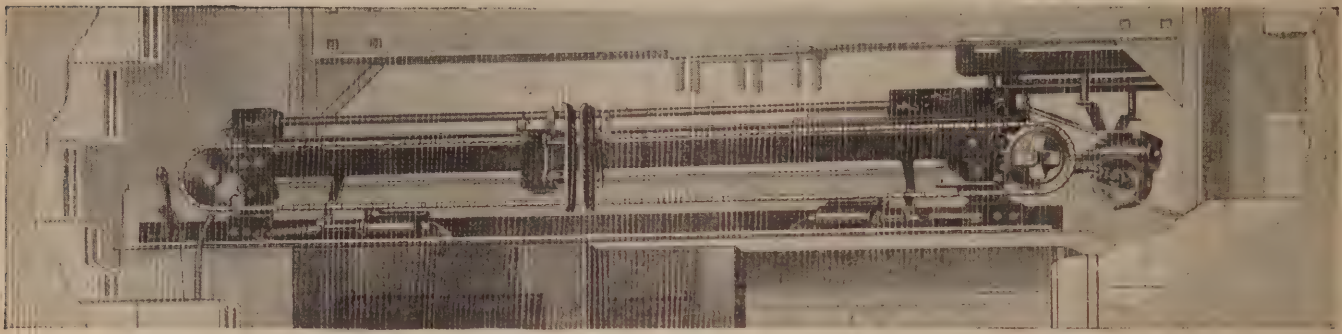
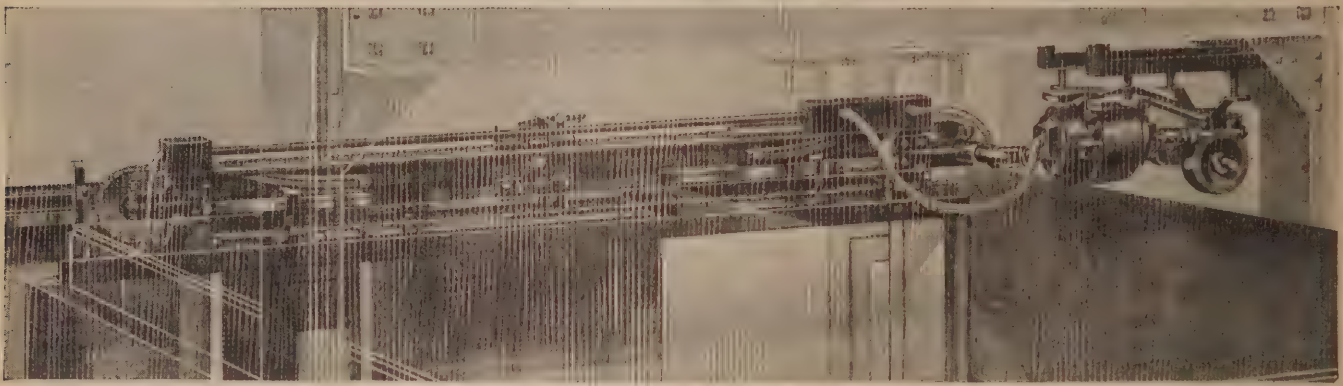


Elevation looking toward the cab from corridor side, with top of doorway and hangers cut away to allow a clear view of the operating machine.

The only proven electric method is Pow R-Way



View looking toward the corridor doors from the top of the cab, showing motor drive unit suspended from elevator cross beams and operating machine mounted on top of cab just above the entrance.

Speed, Safety and Economy

PowR-Way possesses all these virtues. It opens and closes elevator doors speedily, smoothly, quietly, *by electricity.* The speed, while constant and invariable, may be regulated.

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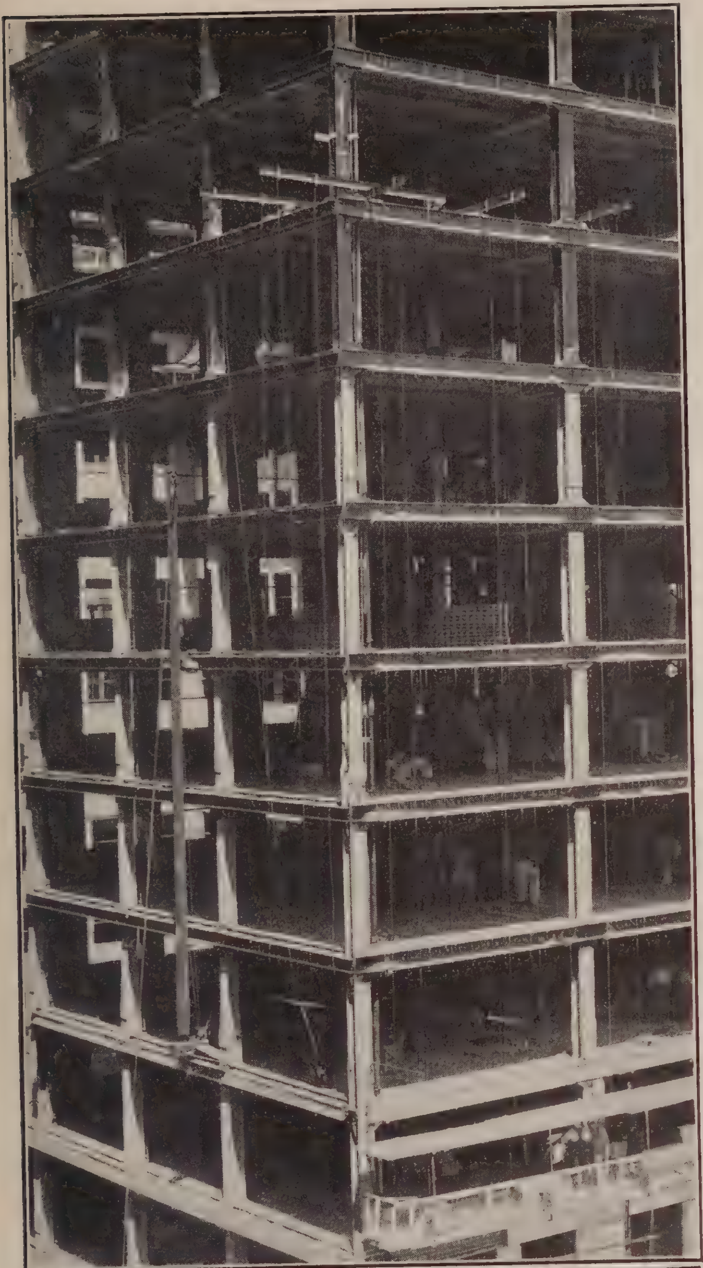

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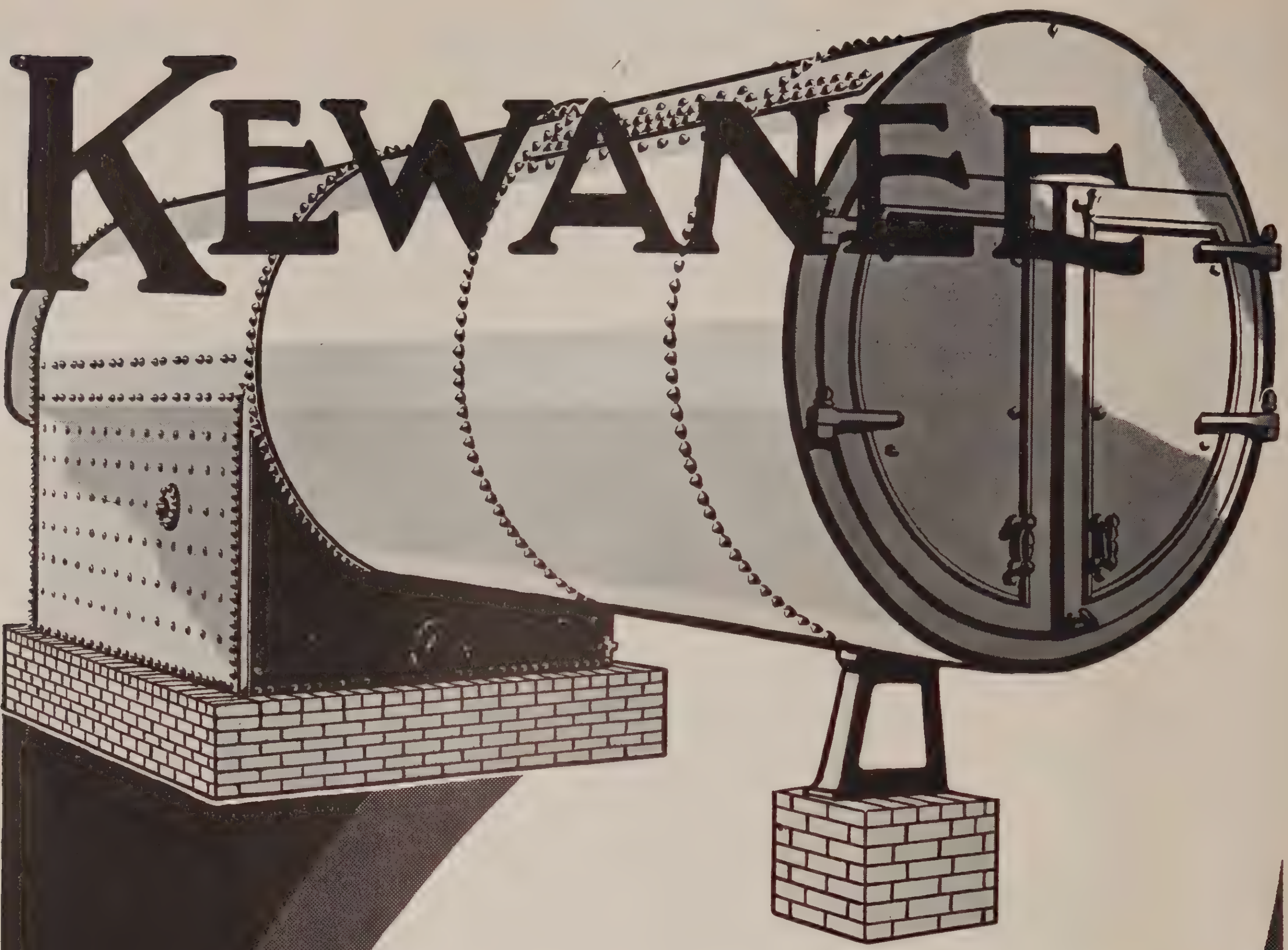

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33⅓%

More Steel Reinforcing Segments

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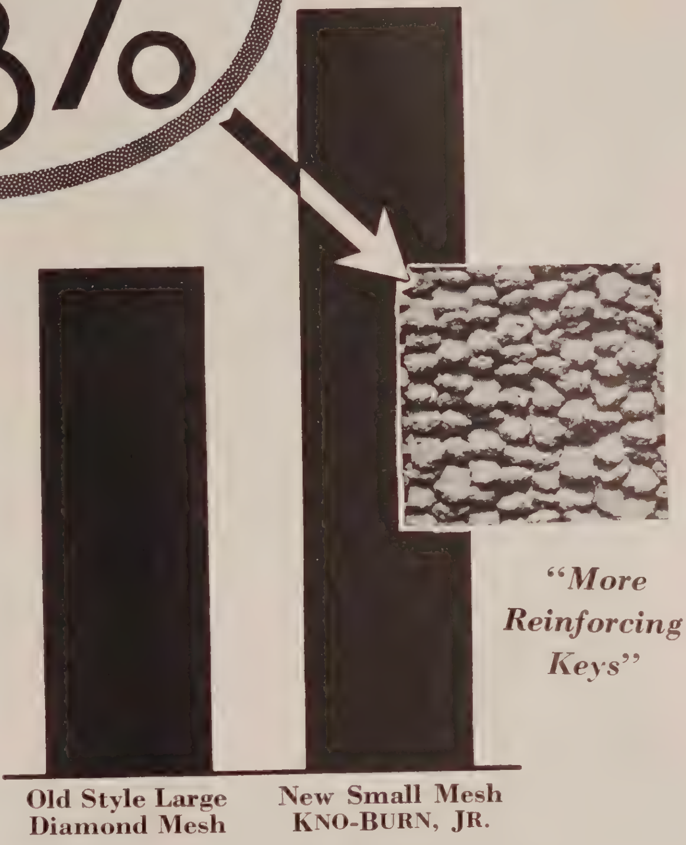

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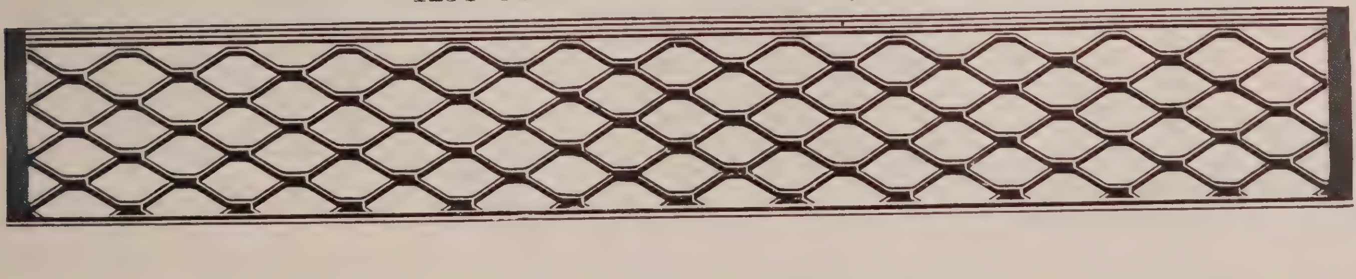

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Catalog in Sweet's Arch't. Cat., 24th Ed., pp. D5116-23
Catalog in Specification Data, 1929 Ed., pp. 228-229

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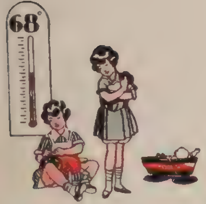
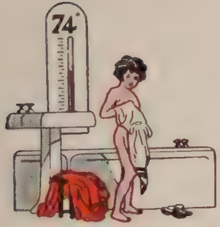


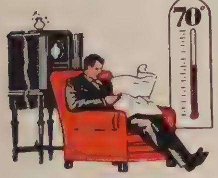
Playroom

Bed Rooms

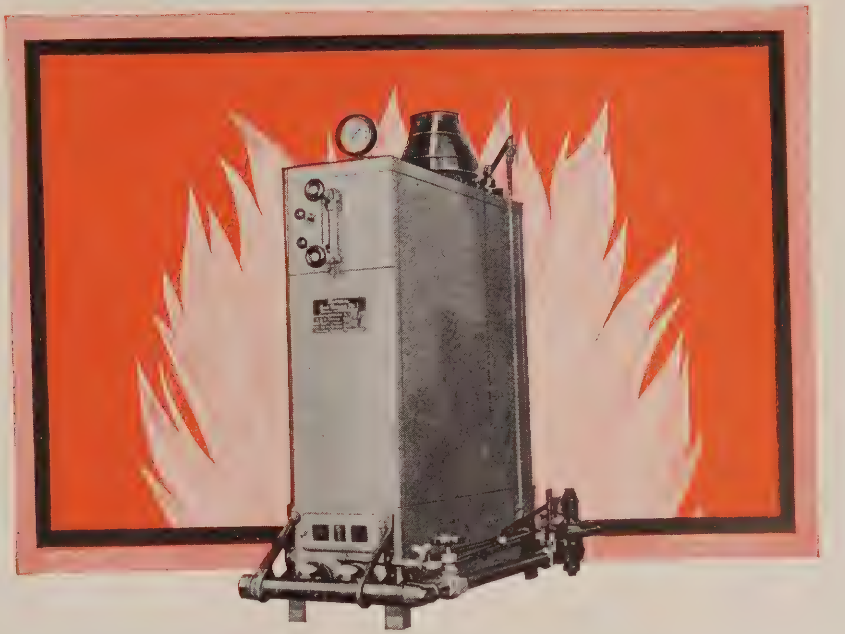
Grandma's Room



Bath Room



Living Room



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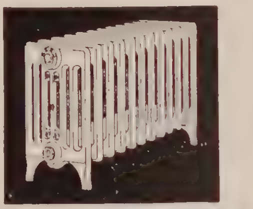

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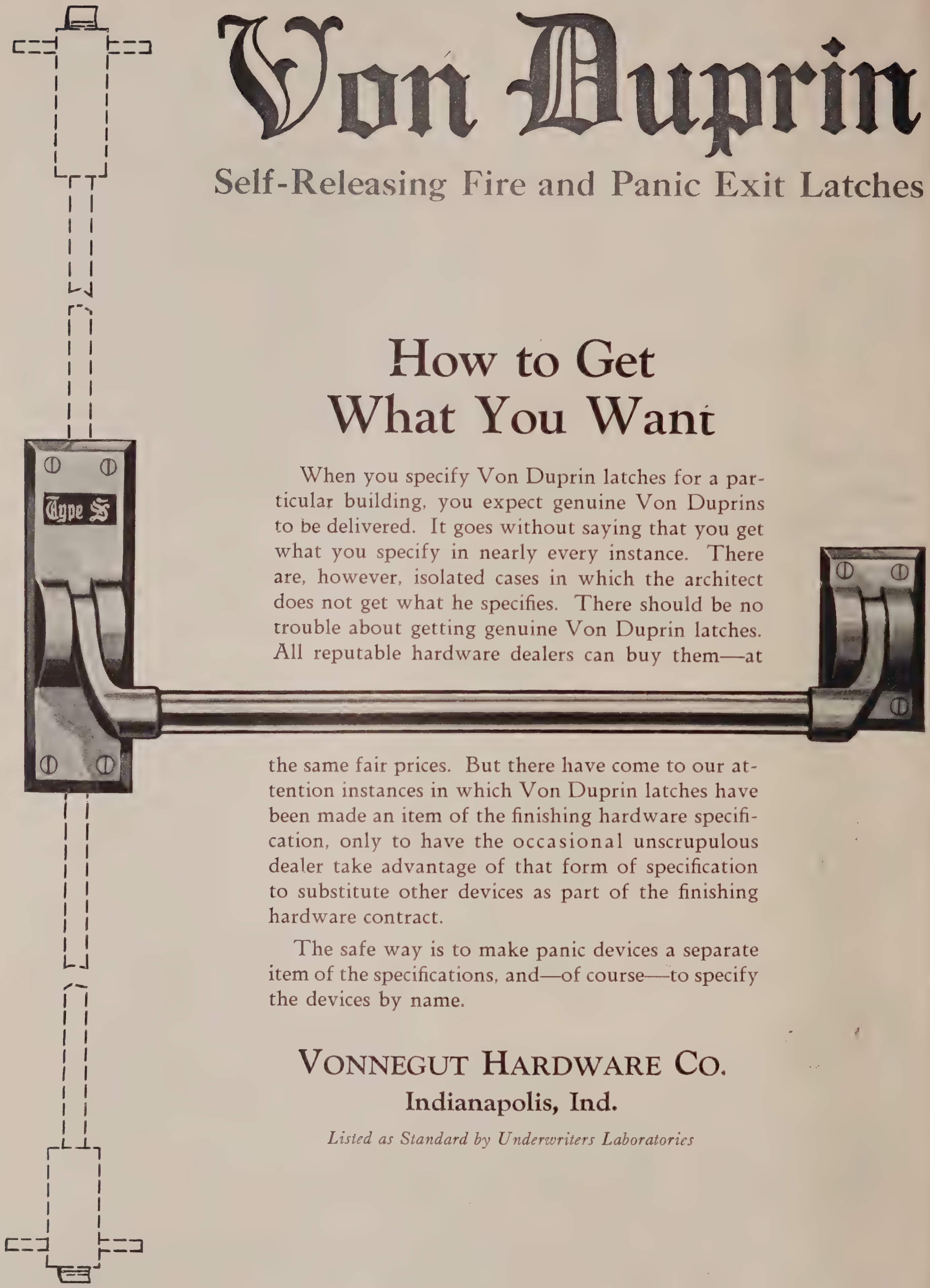

How to Get What You Want

When you specify Von Duprin latches for a particular building, you expect genuine Von Duprins to be delivered. It goes without saying that you get what you specify in nearly every instance. There are, however, isolated cases in which the architect does not get what he specifies. There should be no trouble about getting genuine Von Duprin latches. All reputable hardware dealers can buy them—at the same fair prices. But there have come to our attention instances in which Von Duprin latches have been made an item of the finishing hardware specification, only to have the occasional unscrupulous dealer take advantage of that form of specification to substitute other devices as part of the finishing hardware contract.

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VONNEGUT HARDWARE CO.

Indianapolis, Ind.

Listed as Standard by Underwriters Laboratories

Pump rating *merely* in sq. ft.
may prove a boomerang. . .

To Insure Heating Pump Performance

tested air and water capacities should substantiate published ratings

CONDENSATE to be removed from a return line vacuum heating system may vary in volume as much as 40%. Quantity of air or vapor also fluctuates widely. For this reason, square feet of installed radiation is not the only factor to consider in choosing the correct size of pump to use. Several others must be recognized. Pressure in the system, efficiency of traps, tightness of joints, fittings and valves cannot be overlooked.

So, every Jennings Vacuum Heating Pump is rated by guaranteed air and water capacity determined by actual test. For a specified amount of radiation, a given size of Jennings Pump is recommended only if its combined air and water capacity is proved adequate to handle this radiation under all conditions. A Jennings Pump with the air and water capacities given in the table can be relied on to serve satisfactorily any reasonably well installed system for the life of the building.

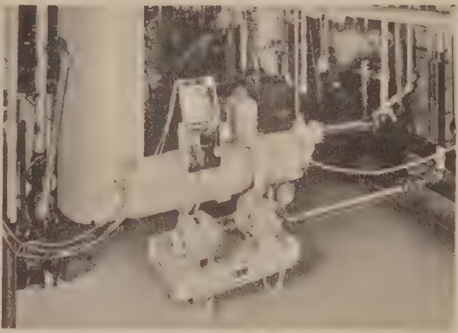
Actual Tests Determine Jennings Pump Capacity

Air and water capacities are accurately measured. The pump is tested with its own motor and control equipment. The entire assembly is made to prove its fitness for the work which it has to perform. A certified report of the test is furnished to the purchaser.

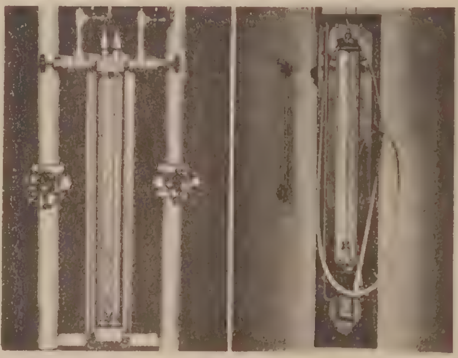
CAPACITIES OF
JENNINGS VACUUM HEATING PUMPS

Pump Size	Equivalent Direct Radiation Square Feet	Water Capacity G.P.M.	Air Capacity Cu. Ft Per Min.	Orifice Diameter Inches	MOTOR HORSEPOWER			
					10 Lbs	20 Lbs	30 Lbs	40 Lbs.
T	2,500	4	3	7/64	1/3	1/2	1	1 1/2
U	5,000	9	3	7/64	1/3	1/2	1	1 1/2
V	10,000	14	6	5/32	1	1	1 1/2	2
B	16,000	22	9	3/16	1 1/2	2	3	5
C	26,000	35	15	1/4	2	3	5	5
D	40,000	60	19	9/32	3	5	5	7 1/2
E	65,000	90	34	3/8	5	5	7 1/2	10
F	100,000	140	50	7/16	7 1/2	10	15	15
*G	150,000	200	102	9/16 & 5/16	10	15	UPON REQUEST	
*H	300,000	400	171	2-7/16 & 1-9/16		UPON REQUEST		

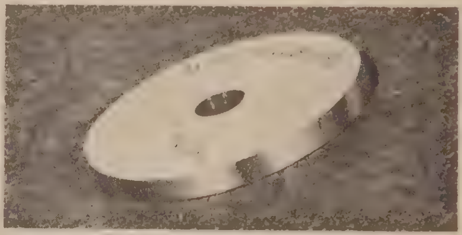
* *The last two sizes are not of the manifold type.*



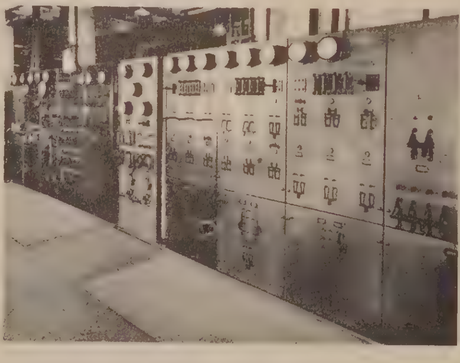
JENNINGS VACUUM HEATING PUMP ON TEST STAND



TYPE OF VENTURI METER AND VACUUM MANOMETER USED IN TESTING JENNINGS VACUUM HEATING PUMPS



STANDARD TEST ORIFICE



SWITCHBOARD IN NASH TEST PLANT WHICH FURNISHES ELECTRIC CURRENT OF ANY VOLTAGE, PHASE AND FREQUENCY

Water Capacity Is Tested by Venturi Meter

Water capacity is checked by testing the volume of water in g.p.m. that the pump removes from the receiving tank *under the given vacuum* and delivers against the specified discharge pressure.

Air Capacity Is Measured by Calibrated Orifice

Air capacity is found by means of a calibrated orifice of specified diameter, reamed in a brass plate one-eighth inch thick, located in the pump suction, and communicating with the receiving tank. This orifice determines the cubic feet per minute of air that the pump withdraws from the receiving tank and discharges to the atmosphere.

Air capacity is determined at the same time that the pump is delivering its rated volume of water. Water capacity is measured while the pump is handling its maximum rated quantity of air.

Only by such *tested* air and water capacities can good heating pump performance be assured. It pays to demand a certified factory test report, and to substantiate this wherever possible by a second test on the job.

Certified Test Report

Nash Engineering Co

CERTIFIED REPORT OF TEST

Jennings Pumps

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SOUTH NORWALK, CONN., U. S. A.

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Park Lane Apartments, Hackensack, N. J., are guarded by Exide Emergency Lighting Batteries. Arthur E Dore, Hackensack, N. J., Architect.

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THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

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Plus THE SERVICE
Plus THE COMPANY

The Incinerator

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Garbage and Waste Disposal for New and Existing Buildings

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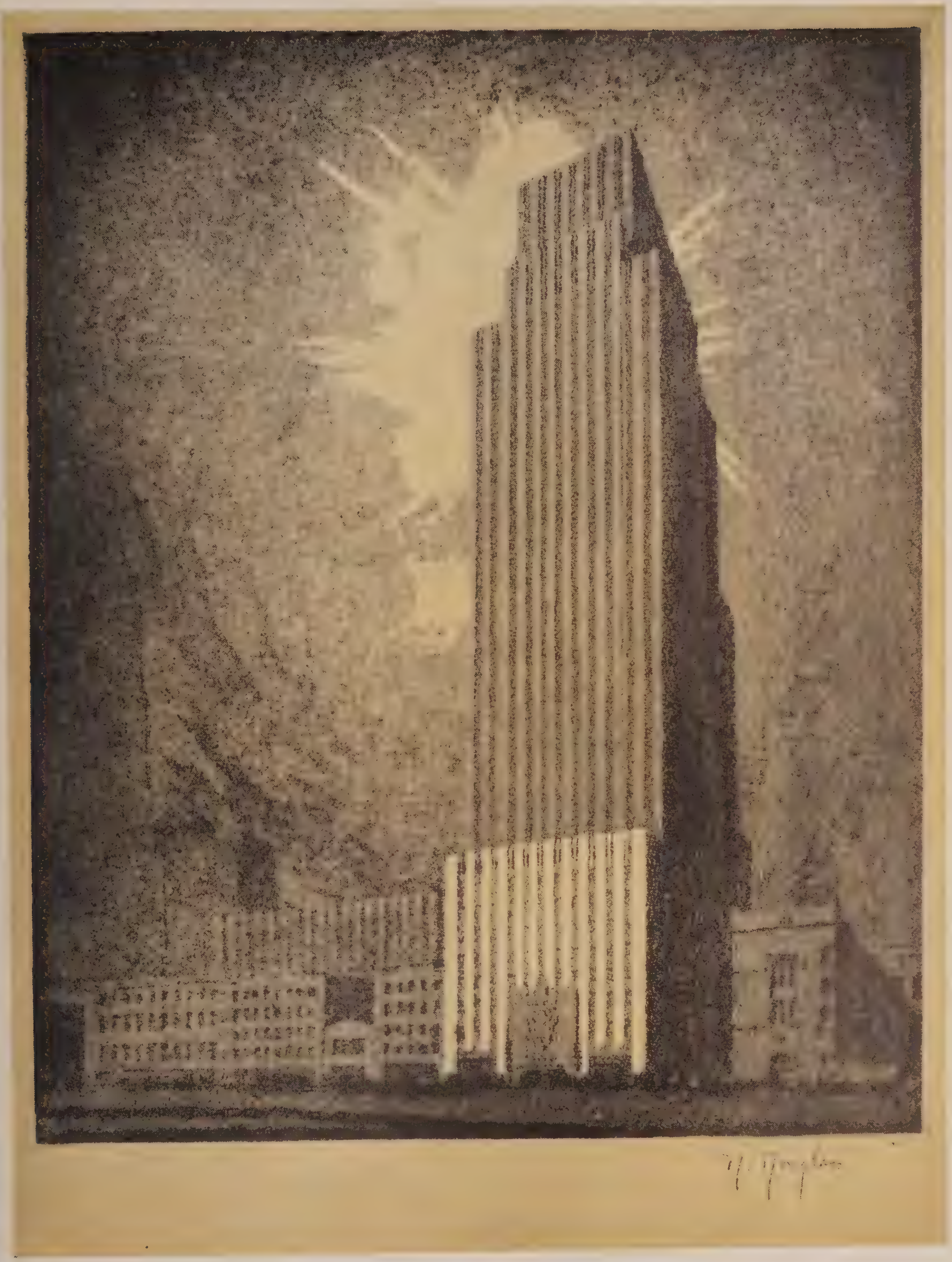
715 EAST WATER STREET MILWAUKEE



Aquatint study of the News Building, New York, N. Y. ∽ John Mead Howell and Raymond M. Hood, Architects ∽ Hegeman Harris Co., Inc., General Contractor ∽ Alvord & Swift, Heating Contractor ∽ John McMillan Co., Inc., Plumbing Contractor. Jenkins Valves are used for both the heating and plumbing of this new building. Jenkins Bros. ∽ New York ∽ Boston ∽ Philadelphia ∽ Chicago . . . Jenkins Bros. Ltd. ∽ Montreal ∽ London.

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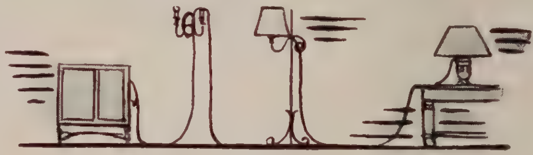
Thousands of prospective "new-house-buyers" have had the experience of living in houses that were inadequately wired. They are tired of having a network of lamp cord covering the walls and floor. They demand more circuits and



NON-METALLIC

more outlets in the new houses they buy.

There is no market for inadequate wiring...Non-Metallic Sheathed Cable costs much less to install. With it you can provide your houses with adequate wiring systems **and still be within your budget.**

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If you're not fully acquainted with Non-Metallic Sheathed Cable ask your electrical contractor—or write to any of the Licensed Manufacturers listed below for the booklet—"Where and How to Use Non-Metallic Sheathed Cable".

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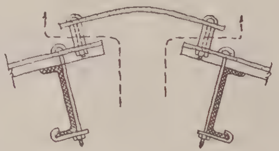
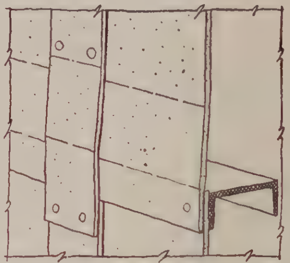


VENTILATING RIDGE

·SECTION·
·TYPICAL DETAIL·



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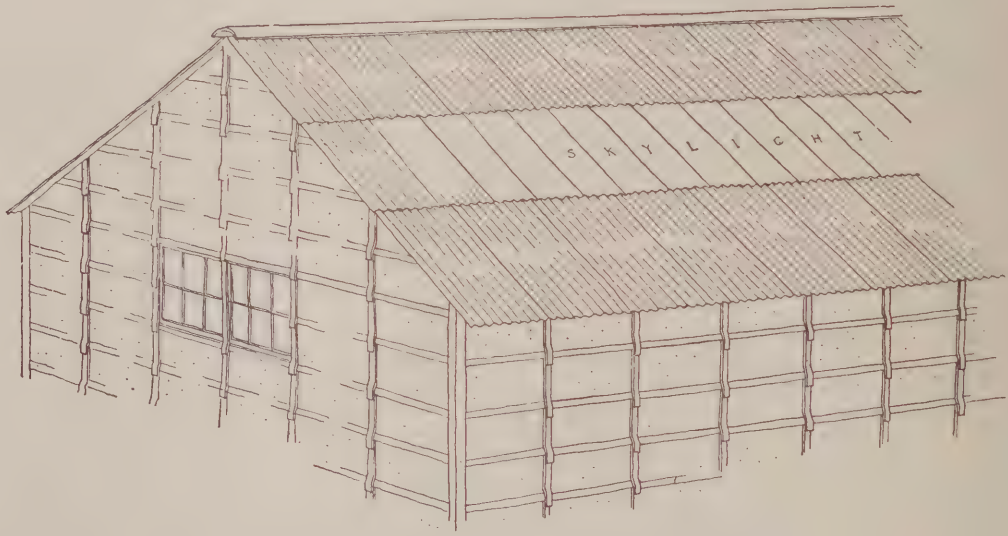

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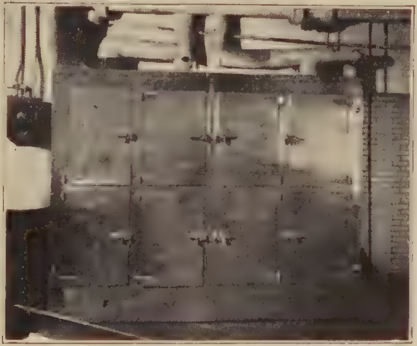
LORILLARD Service Refrigerators at West Point Military Academy—lined throughout with Monel Metal.

Interior of LORILLARD Cooling Room at West Point. Note overhead tracks for meat hooks and the Monel Metal faced Door.

Entrances to LORILLARD Cooling Rooms at West Point. Doors are faced with Monel Metal inside and outside, with Monel Metal jambs.

LORILLARD Refrigerators and Refrigerated Counter with Monel Metal Top in the kitchen of the New York Athletic Club.


LORILLARD Refrigerator in the D. L. & W. R. R. Station Restaurant, Hoboken, N. J. Faced entirely with Monel Metal.

Monel Metal lined LORILLARD Refrigerator in the Savarin Restaurant in the New York Life Bldg., New York City.

To maintain the high standards of materials and craftsmanship established in 1877, LORILLARD Refrigerators are built with a painstaking care almost unknown to this modern age. Doors are fitted by hand. Hardware is at least 50% heavier than that ordinarily used. The cork board insulation will stand immersion in boiling water without disintegrating or an expansion of more than 2% of its dimensions.

All LORILLARD Refrigerators are built in our own factory at Kingston, N. Y., of selected lumber that has been properly seasoned in our own kilns. The interiors are lined with heavy galvanized iron, porcelain enameled iron, tile or glass. Some of the finer models are lined with Monel Metal throughout. Every detail of material, design and construction is planned to increase the satisfaction of LORILLARD users.

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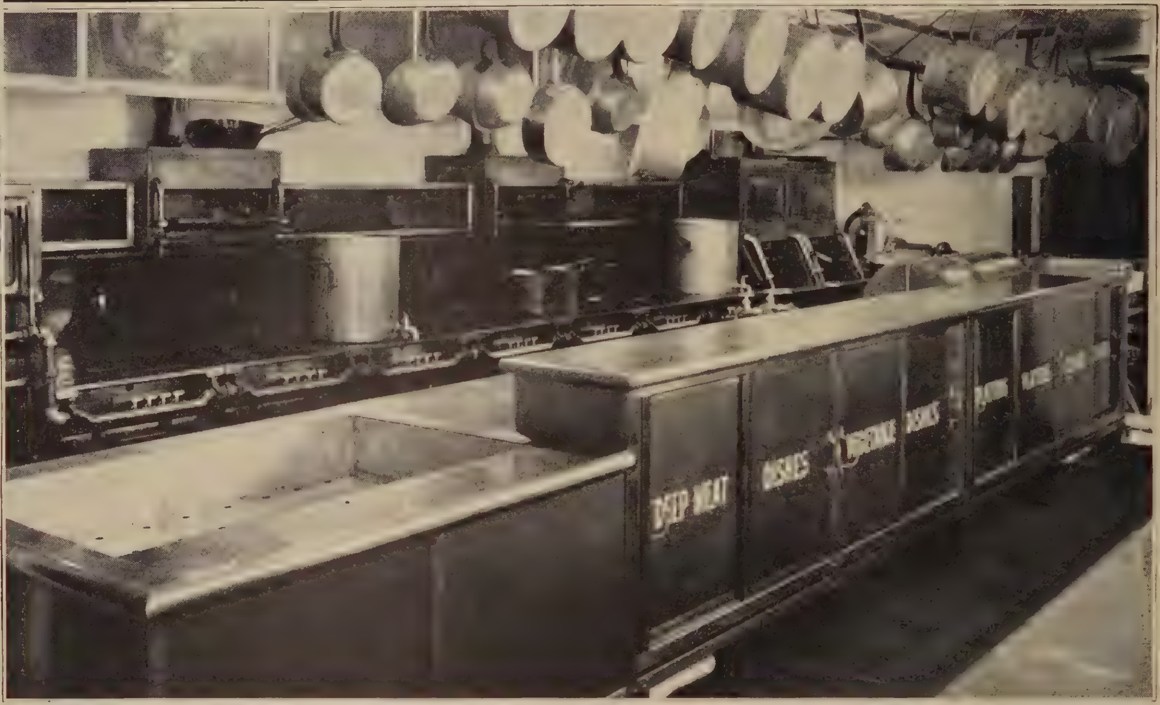
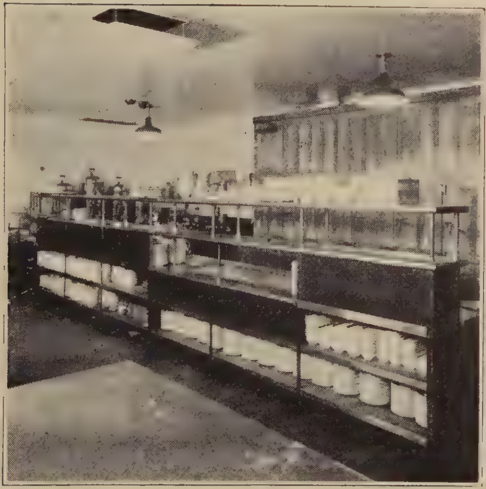
THE GOVERNOR CHOSE

The Hotel Governor Clinton, New York Latest addition to Van's roster of noted hotels.

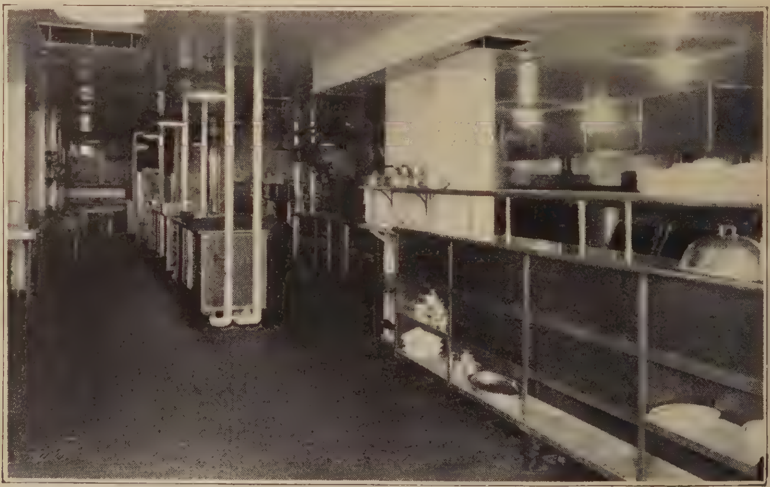


MURGATROYD AND OGDEN
Architects

The heart of the kitchen is the range and broiler section. Here is shown this division of the Hotel Governor Clinton Kitchen. The cooks' tables have Monel Metal tops.



The salad pantry is provided with capacious storage and counter space. The refrigerators are Lorillard.



A general view of the main kitchen of the Hotel Governor Clinton, New York, created and installed in its entirety by the John Van Range Company.

CLINTON
VAN EQUIPMENT

This great new hotel wanted kitchen equipment that would STAY *new*

Equipment that has something more than surface polish. Equipment that will stand up under years of heavy duty. Equipment that will give uninterrupted service without costly breakdowns or replacements! These were the specifications of the Hotel Governor Clinton.

The hotel management compared brands, claims, prices and previous records. They examined other kitchens. Their final choice . . . the choice of thousands of hotel men during the past 75 years . . . was Van Equipment. No doubt you already know why. Perhaps Van has always been *your* choice, too. If not, we'll gladly send details.

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The compact kitchens for the Governor Clinton Grill and Coffee Shop. The dishwashing section is at the left; in the background is the range and broiler division.

The room service pantry is equipped for prompt service of hot food. The large Lorillard Refrigerator is one of many recent installations.

These New Books Free

Planning Restaurants That Make Money. An 80-page booklet on the architectural and business problems to be considered in planning all types of commercial restaurants.

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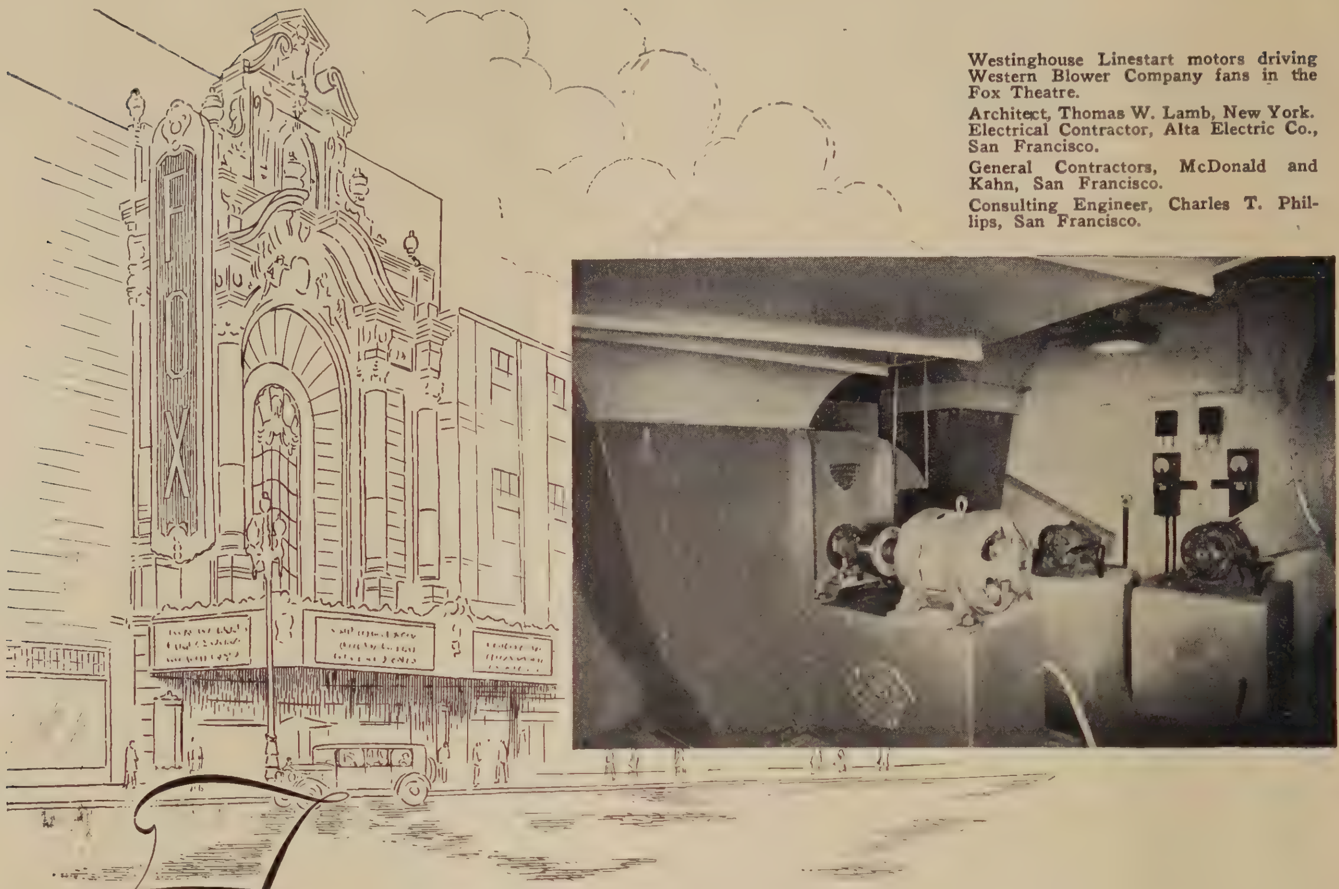

Westinghouse Linestart motors driving Western Blower Company fans in the Fox Theatre.

Architect, Thomas W. Lamb, New York. Electrical Contractor, Alta Electric Co., San Francisco.

General Contractors, McDonald and Kahn, San Francisco.

Consulting Engineer, Charles T. Phillips, San Francisco.

Fresh air -- every five minutes

MODERN theatre builders realize that good, dependable ventilation means continued patronage.

The new Fox Theatre in San Francisco radiates comfort, charm and relaxation from the moment one steps within the door. It's perfect ventilation system contributes much to this pleasing atmosphere.

Powerful Westinghouse motors drive ventilating fans and blowers which circulate the air at the rate of 140,000 cubic feet per minute. Every breath of air in the theatre is changed every five minutes, so that regardless of weather conditions, patrons are constantly assured of the comfort of being surrounded by fresh, clean air.

In the engaging atmosphere of this theatre, Westinghouse equipment plays a conspicuous role—a part that offers a striking example of cooperative effort and unified responsibility.

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PRINCIPAL CITIES OF THE UNITED STATES

Westinghouse

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. . . if it breaks down the mortar joint it will break down the wall

The best protection against the effects of time on masonry is a mortar bond that will endure the disintegrating attacks of passing years as sturdily as the brick or stone it bonds together. Such a lasting bond is produced with Kosmortar. Its strength and endurance result in a mortar bond that will remain, without the need of patching or repairing, an integral part of the masonry. Merely the mixture of sand and water with Kosmortar produces this strong, hard mortar, consistently as strong as 50-50 cement and lime mortar. Because of its skilful chemical composition and laboratory-controlled manufacture, Kosmortar eliminates hit-or-miss methods of mixing boxes.

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Made in the same mills as Kosmos Portland Cement, a brand that has been distinguished for high-test, uniform and reliable quality for over twenty years.

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A MASON'S CEMENT—*EASY TO SPREAD*

. . . bonds walls to stay

Atlantic City's

THE Hotel Claridge, now under constru
tion, is Atlantic City's latest skyscraper.

Strategically located at Brighton Plac
Indiana Avenue, and Park Place; fronted by
superbly landscaped city park; overlooking
night the ever-changing hues and shapes of t
municipal G-E Novalux electric fountain; a
with a broad, unobstructed view of the oce
—no wonder that McIlvain and Roberts
Philadelphia, the architects, take justifiab
pride in this project.

In planning, no detail of construction w
spared to make each of the twenty-four stori
accessible, convenient, and modern. Henc
General Electric elevator control has be
selected to supply swift and dependab
vertical transportation in the beautiful ne
Claridge.

Model of the new Hotel Claridge—Architects: McIlvain and Roberts, Philadelphia, showing park and G-E Novalux electric fountain in the foreground.

See this model at the General Electric Company's National Exhibit at
Central Pier, 1400 Boardwalk, Atlantic City

GENERAL

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

New Skyscraper

FIVE Gurney elevators, rated 2500 lb. at 700 ft. per minute, driven by General Electric elevator equipment of the gearless traction type having variable-voltage control and automatic leveling, will be used in the Claridge.

In their choice of elevator equipment, Messrs. McIlvain and Roberts were governed by the following factors:

The safety of passengers
The comfort of passengers
The prevention of shutdowns
The minimizing of running time

These important advantages are obtained in G-E elevator equipment by the careful interdesign of the component parts, which results in a smoothness of operation almost unbelievable, yet rapid, accurate, simple, and dependable.

The Hotel Claridge will benefit by four outstanding General Electric contributions to the art of elevator control.

Automatic control of elevator-speed regulation, both at running speeds and at approaching and landing speeds.

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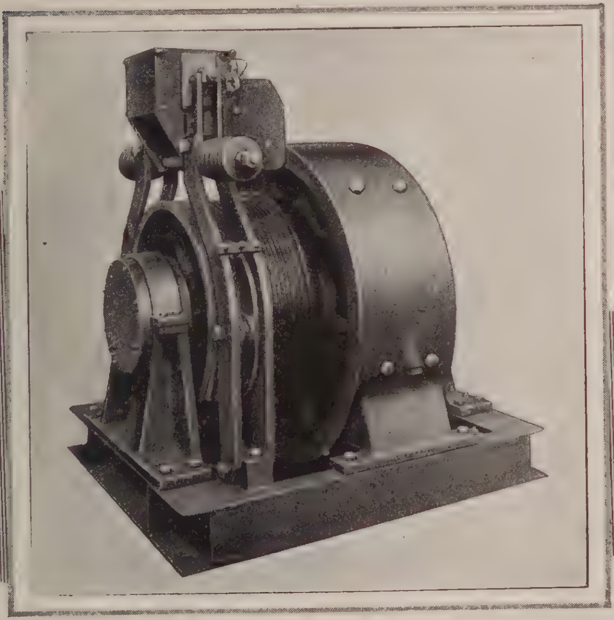
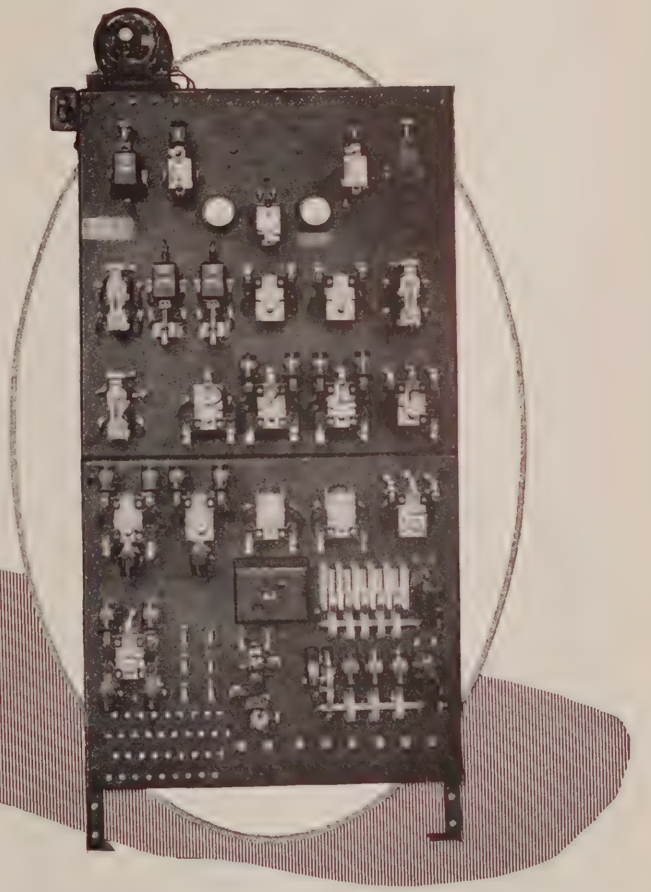
Improved design of elevator equipment, rendering operation more effective and reducing maintenance cost.

Automatic leveling control of the simplest, most accurate, and reliable type, effected through the main elevator motor.

Whenever there exists a problem in vertical transportation in any building, old or new, General Electric stands ready to provide suitable electric elevator equipment.



General Electric gearless traction elevator motor



General Electric control panel for automatic leveling

200-323

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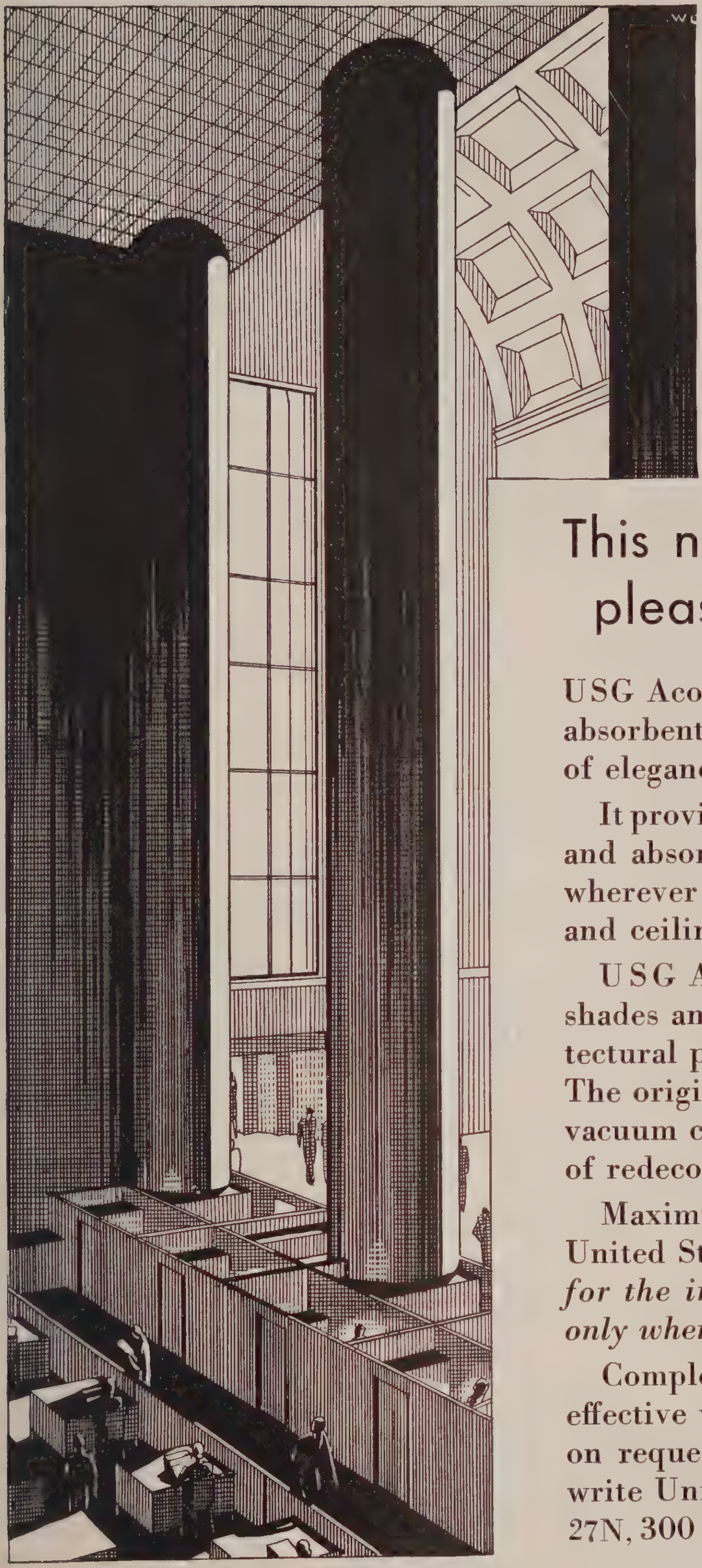

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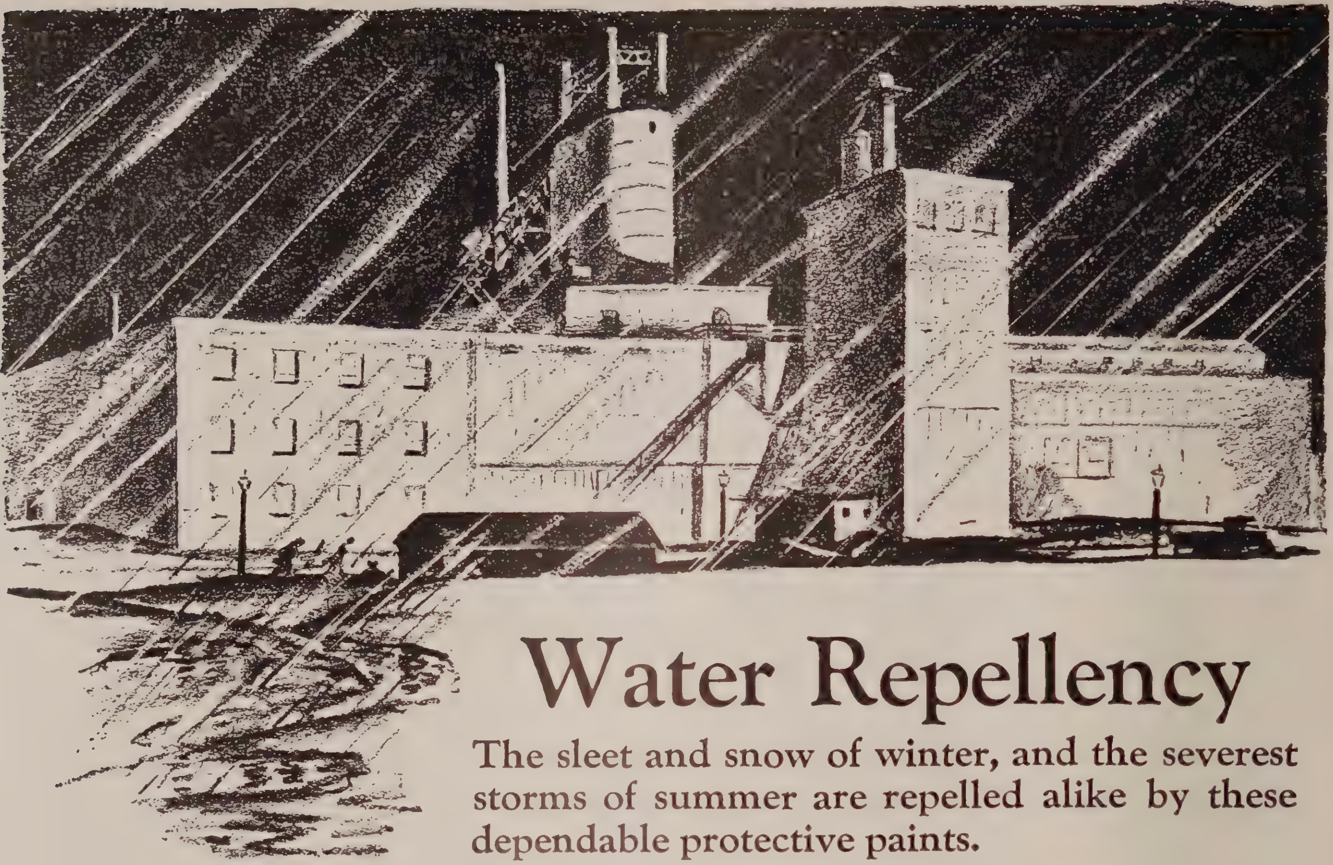
USG Acoustical Tile is available in several shades and sizes to harmonize with any architectural period. Redecoration is not required. The original appearance is easily restored by vacuum cleaning at a fraction of the usual cost of redecoration.

Maximum noise absorption is assured. The United States Gypsum Company *will contract for the installation of USG Acoustical Tile only where the desired results can be secured.*

Complete information for your files on this effective way to control acoustics will be sent on request. Phone your local sales office or write United States Gypsum Company, Dept. 27N, 300 West Adams Street, Chicago, Illinois.

USG ACOUSTICAL TILE

A product of UNITED STATES GYPSUM COMPANY



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The sleet and snow of winter, and the severest storms of summer are repelled alike by these dependable protective paints.

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And flake silica-graphite has proved, over the years, to be an unusually effective pigment for metal protective paints. It has a peculiar quality of *"Water Repellency"*; and as corrosion does not occur except in the presence of moisture, *much longer protection is assured.*

It is also absolutely inert, chemically speaking, hence not affected by the action of gases, acids, alkalis, and other destructive agents.

A complete line of Dixon's Industrial Paints in 14 colors, including *Bright Aluminum* and *Standard Red Oxide* is now available. Write for color card No. 227 BI.

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give maximum protection to wood, composition, concrete and cement floors. Suitable for use indoors or outside. Write for color card No. 227 BF.

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Jersey City, N. J.
Established 1827

BOOK DEPARTMENT

WOOD CONSTRUCTION

A REVIEW BY

CLIFFORD WAYNE SPENCER

THE great practical value of a handbook covering all phases of the use of wood in construction will be readily appreciated by all those who are in any way connected with the building industry. The volume on wood construction which is the subject of this review is both complete and up to date in every detail, being a project of the National Committee on Wood Utilization, which was formed in 1925 by Herbert Hoover, its first chairman. The preparation of the work dealing with the utilization of wood for construction purposes was under the control of and sponsored by a sub-committee whose membership included representatives of many organizations,—The National Association of Builders' Exchanges; United Engineers and Constructors, Inc.; The American Society of Civil Engineers; The American Institute of Architects; and the Associated General Contractors of America,—as well as unattached architects, engineers, a director of research in retail lumber, Antioch College, and the editor of the *Engineering News-Record.* The actual preparation of the work was carried out by Dudley F. Holtman, construction engineer for the National Committee on Wood Utilization, with the coöperation and assistance of the control committee which endorses the work as being "an outstanding, authoritative, and up-to-date work on the efficient use of wood in the building and construction field."

The construction of wood buildings is a science that has come down through long ages as a matter of craftsmanship. It has developed slowly, and different practices and usages have been passed on from one generation of workers to the next in the form of a trade, so that a great deal of the essential information regarding the use of wood has never been made available in printed form. With the modern era there have come rapid changes in the methods of carrying out all types of building construction, and it is more or less difficult to keep abreast of the times and to be well informed on up-to-date methods used in all types of construction, including that of wood. In order to make available to architects, engineers, and builders the unprinted information of the craft as well as the new facts and the methods discovered by modern science, the editor and sponsors have undertaken the preparation of this work. "Fundamental facts concerning the nature and available forms of wood, and fundamental principles in the use of wood, constitute the most important part of this book. The aim has been to furnish basic information for use in designing and specifying wood construction, and to aid in the efficient selection and application of the material, and in the adoption of efficient, economical forms of design.

"The first seven chapters give information on the factors affecting the use of wood in construction; lumber grading, grade provisions, and working stresses; the principal woods used in building and construction; the identification of common woods; preservative treatment; the use of paints and stains, and methods of preventing termite damage. The last four chapters contain information on approved methods of using lumber in light building construction and millwork, and in both heavy timber and temporary construction. In the appendix there are given compilations showing the standard grades produced in the various species, and tables of the lumber grades used for various construction purposes."

The subject of the supply available and the physical structure of wood is treated, starting with the most fundamental and elementary facts and developing into quite a scientific treatise covering such matters as the cellular structure of woods, density, moisture and various defects that are likely to occur in the structure of commercial woods, including knobs, pitch streaks and pitch pockets, pin worm holes, grubworm holes, checks, shakes, compression wood, and cross graining. The effects of these defects on the strength and durability are pointed out and discussed. An interesting passage in the work is that in which the author points out that certain common popular beliefs in regard to the strength of wood are not founded on fact. Such beliefs include the popular supposition that wood cut from dead trees is likely to be weaker than that cut from live trees; that virgin growth or second growth trees all produce wood of a similar strength, and that the hard woods and soft woods are affected in opposite manners by the fact that they are first or second growth timber; that time of cutting has an important effect on the durability of wood; that air-dried wood is stronger than kiln-dried wood or vice versa. The author expresses the opinion that all these popular beliefs are either erroneous or are true to such a limited extent as to be unimportant from a practical standpoint.

The subject of lumber grading is important to the specification writer, since by the use of the standard symbols and terms adopted by the lumber industry for signifying the sizes or character of lumber he may make it very definitely understood exactly what kind and quality of lumber he wishes to use. The definitions of lumber grading terms, the abbreviations applying to lumber and various standard rules and grades are a result of investigation of the most approved usage current in the lumber industry and are standard, authentic and up-to-date. The information contained in these pages of standard sizes, terms, and other usages is well nigh indispensable if one is to make really intelligent use of wood as it is commercially supplied. The tables and notes on working stresses give extreme fiber in bending,

Unless otherwise noted, books reviewed or advertised in THE ARCHITECTURAL FORUM will be supplied at published prices. A remittance must accompany each order. Books so ordered are not returnable.

maximum horizontal shear, compression perpendicular to grain, and the modulus of elasticity for both select and common grades of a large variety of common woods, according to the purposes for which they are to be used in buildings or other structures.

One of the most important questions to be decided when wood construction is contemplated is, what variety of wood is best fitted to serve all purposes in that particular case. This is a question which is far too often decided in a haphazard and inefficient manner. Architects or their assistants are very likely to pass final judgment on this matter without devoting sufficient study to the governing factors and without having sufficient knowledge of the subject on which to base such an important decision. The enumeration of the principal woods used in building and construction, contained in this book, is intended to give information of practical value on the properties of the various species and to point out the uses to which each wood is most commonly applied. Judgment is needed to select the proper species for particular uses, but judgment cannot be better than the information on which it is based. Therefore an effort is made to give reliable, authentic information, based upon the experience of those who use wood in construction. The forest region in which each species grows is described, and the peculiar characteristics inherent in a species which affect its use in construction are discussed. Strength, durability, receptivity to paint or stain, and other distinguishing qualities are also outlined. Easy methods for the identification of common varieties of both hard wood and soft wood are described in a separate chapter, and the descriptions of the markings, textures and other characteristics of various woods are illustrated by small plates from photographs showing samples of the various species.

The preservation of wood has been practiced for centuries, but it was not till the beginning of the nineteenth century that the preservation of woods by the injection of chemicals became scientific in principle. Many materials have been used and many methods tried to make wood resist decay, insects and marine borers, and out of this wealth of experience, by the law of survival of the fittest, a few preservatives have come into extensive use. The best of these preservatives are described and their merits discussed. The methods of treating wood with these preservatives are also described. The practice of making wood fireproof or fire-resistant by use of various treatments has become quite prevalent in this country, about 50,000,000 feet of lumber being treated in this way in 1927, and the various methods of treatment for this purpose are also described and discussed. By far the most important form of preserving wood is, of course, by sealing the surface with paint or varnish. Good lumber which is kept properly painted will last practically indefinitely. Points covered in the chapter on paints and stains include such important considerations as the kinds of paint available; the methods of applying paint, comparing the desirability of the use of the hand brush with that of the spray machine; a schedule of paints to be used for various purposes; painting defects, including chalking, blistering and peeling, nondrying and washing paints, "alligatoring," darkening, gas discolorations, copper stains, brown staining, mildew, and various kinds of spotting. The knowledge as to the causes of and remedies for these various defects to which

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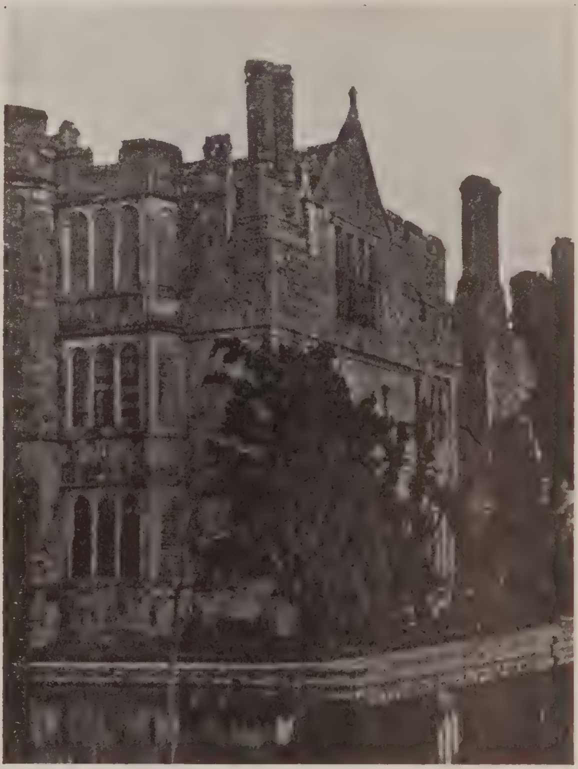

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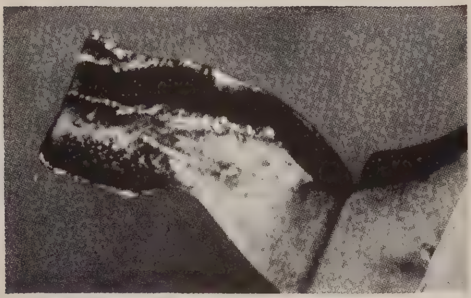

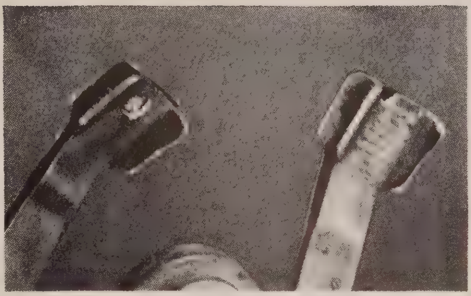

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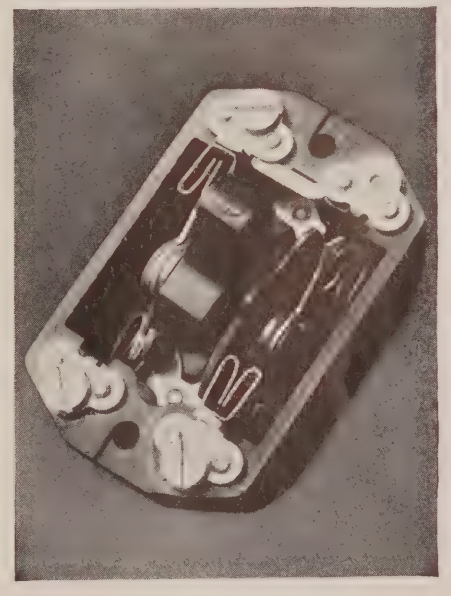

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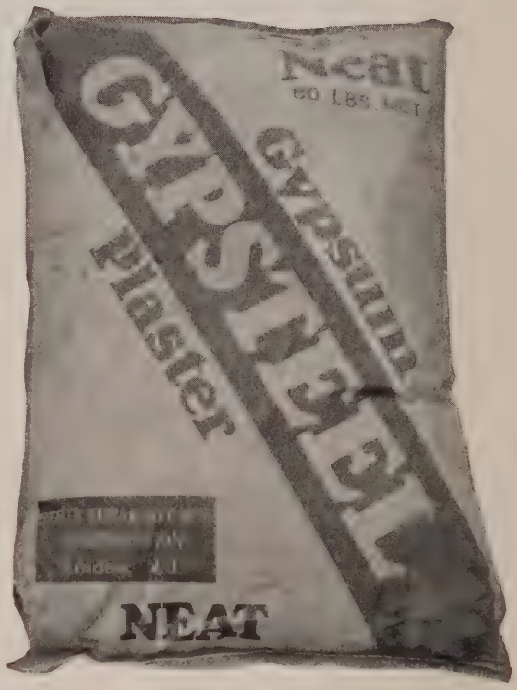

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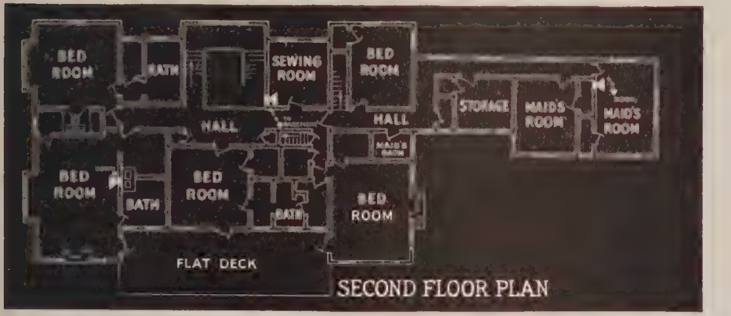

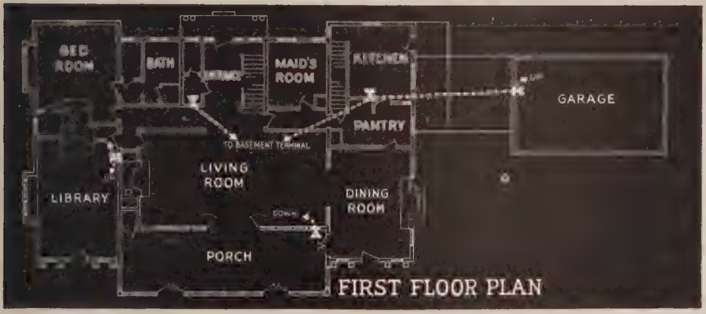

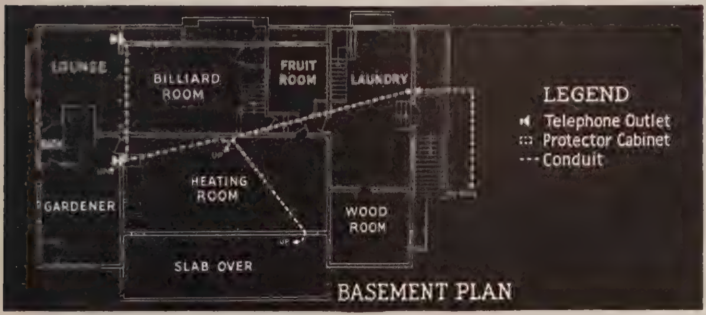

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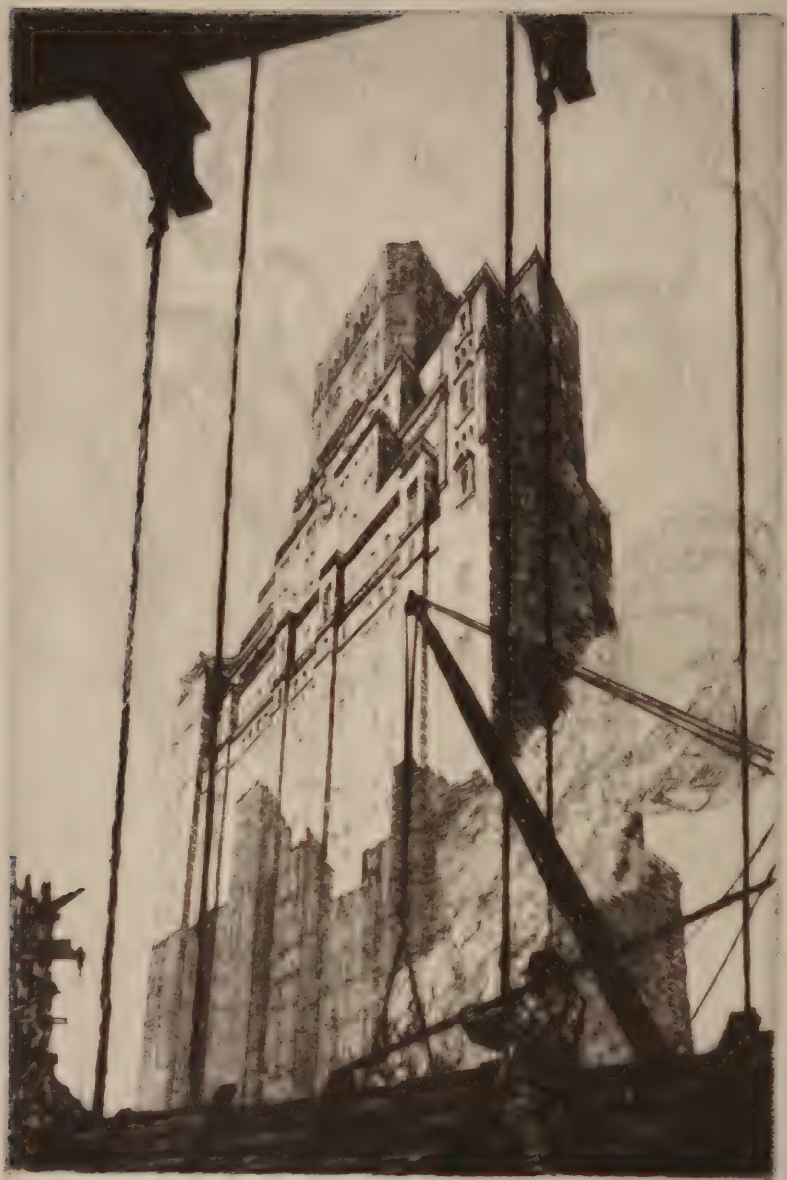

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THE PRESENT STATUS OF THE HOTEL BUSINESS

BY
JAMES S. WARREN
EDITOR *Hotel Management*

FAR-REACHING changes have taken place in the hotel business in the past 12 years. While it is a fact that this is also true in most, if not all, other business fields, there have in this period been several outstanding changes in the nation's economic structure which have peculiarly and individually affected hotels.

Prohibition's Effects. In the first place, the Eighteenth Amendment and the Volstead Act did away with the hotel bar. Almost overnight the most profitable source of revenue in many hotels was wiped out. Insofar as hotel structures were concerned, the problem presented was not particularly serious. Progressive hotel operators and architects were quick to devise other revenue-producing departments or services that could be installed in the former bars. Frequently these took the form of coffee shops or cafeterias (the latter are now waning in popularity, by the way), while in other cases stores, beauty parlors or soda fountains were substituted.

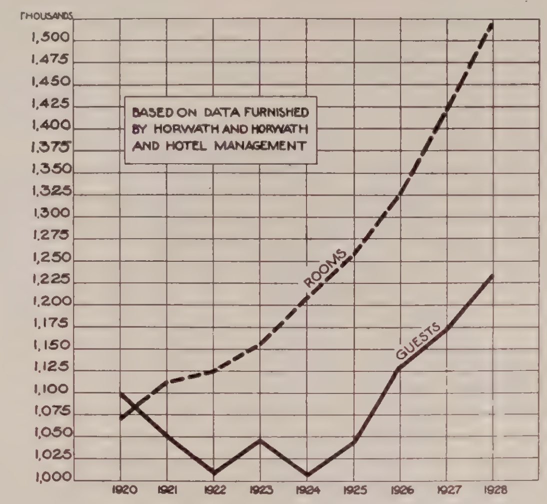
From the standpoint of net profits, however, Prohibition brought with it a most serious problem for hotel executives. Particularly in those hotels whose bars had become popular service features, was it found impossible to make their substitutes produce the same revenue. As shown by one of the accompanying charts, hotel rates were materially increased, and fortunately accommodations were at such a premium at the time that higher prices were paid by the public with little complaint.

On the constructive side of the problem, however, Prohibition did do this for the hotel business: For the first time hotel men at large came to appreciate the fact that they are modern *business men* and in business for the purpose of making a profit on the major items they have for sale,—their rooms and food. Theretofore they had relied in far too many instances on their bars to carry the burden of their entire establishments.

Shortly after Prohibition's advent,—and due no doubt to this new and more businesslike attitude,—a demand for educational training and for basic operating facts began to make itself felt. In 1921 Frank A. Dudley, President of the American Hotel Association, went to the Federal Board for Vocational Education in Washington with a request for an educational survey. "Vocational Education in the Hotel Business," by Layton S. Hawkins and W. I. Hamilton, was the result, and it laid the foundation for the widespread program of hotel education and research that followed. All hoteldom became imbued with a new and wholly desirable sense of its importance in the business community and of its responsibilities to society. Hotel men had graduated from tavern keepers to civic hosts; they represented their fellow citizens well or poorly in proportion to the degrees of comfort, convenience and safety which they afforded visiting strangers.

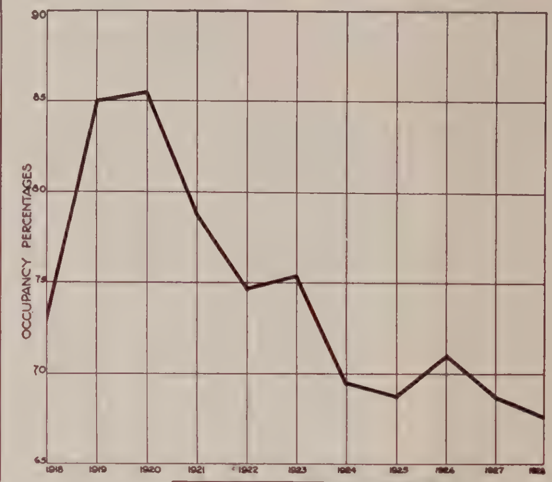
With this new enthusiasm and this new ideal of hotel service it followed quite logically that great strides were soon made in the raising of operating standards, in service refinements, and finally in net profits. Hotel men themselves became so enthusiastic and "sold themselves" and their hotels to their communities so successfully that their fellow business men, in turn, began to look to the hotel business as an added source of individual profit.

***The Boom of* 1920-1927.** They saw what their local hotels, with their improved appearance and service, had done for themselves and the towns. Hotel promoters were not slow to grasp the situation, and in many instances to create such a situation where it had not hitherto existed, with the result that bigger and better hotels began to spring up in many communities that could not afford them. "No hotel is too good for Blankville; we should have as fine accommodations as can be had in New York or anywhere," became the slogan at innumerable Chamber of Commerce, Rotary, Kiwanis and "booster" meetings. And have



YEAR	NUMBER OF ROOMS	PERCENTAGE OF OCCUPANCY	NUMBER OF ROOMS OCCUPIED	NUMBER OF GUESTS (Allow 20% for double occupency)
1920	1,070,000	85.5	914,850	1,097,820
1921	1,111,000	78.8	875,468	1,050,562
1922	1,125,000	74.7	840,375	1,008,450
1923	1,157,000	75.3	871,221	1,045,465
1924	1,207,000	69.5	838,865	1,006,638
1925	1,259,000	68.7	868,933	1,042,720
1926	1,326,000	71.0	941,460	1,129,752
1927	1,424,000	68.6	976,864	1,172,237
1928	1,521,000	67.6	1,028,196	1,233,835

Trend of Number of Rooms and Guests Showing Large Increase in Rooms Available in Recent Years



YEAR	ROOMS AVAILABLE	ROOMS OCCUPIED	PERCENTAGE OF OCCUPANCY	RELATIVE NO. 1920=100
1918	5,939	4,604	77.5	91
1919	9,520	8,098	85.0	99
1920	10,708	9,161	85.5	100
1921	10,707	8,443	78.8	92
1922	15,912	11,901	74.7	87
1923	17,966	13,531	75.3	88
1924	20,464	14,233	69.5	81
1925	22,389	15,392	68.7	80
1926	22,550	16,021	71.0	83
1927	23,617	16,210	68.6	80
1928	26,723	18,054	67.6	79

Trend of Occupancy Percentages in European Plan Transient Hotels, Showing Decrease in Room Occupancy

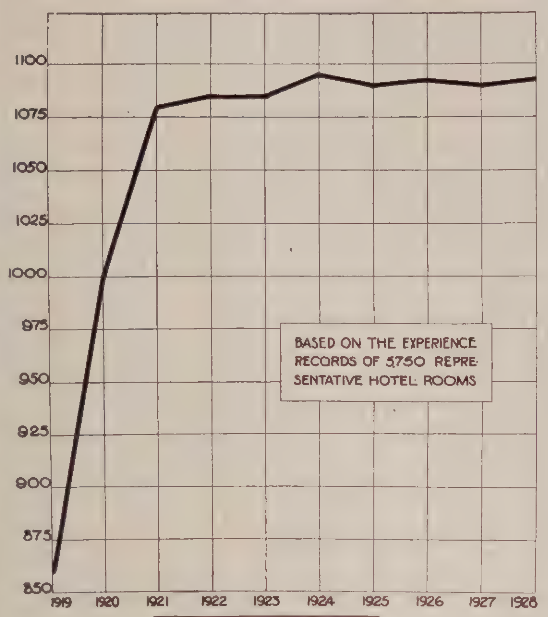
them they did,—with the disastrous results shown all too clearly by several of the charts reproduced with this article. Economists generally characterize the period 1920-1927 as that of the transition from a "seller's market" to a "buyer's market." Industry as a whole suffered from growing pains during this era, just as did the hotel business. Most of the extractive and manufacturing fields overstressed the production function and understressed the distribution and selling functions, with the result that they found themselves with surplus goods on hand.

Over-production. There is, however, this very marked and fundamental difference between the overstocked miner or manufacturer on the one hand, and the overstocked hotel man on the other. The former can curb his future production and store his present stock until the opportunity comes to dispose of it. Or, if his product happens to be perishable, he can profit from his experience and regulate his future production accordingly. A hotel room, on the other hand, is a most perishable commodity. Every night it is not sold it represents an irretrievable loss, for that night will never return. And once a hotel is built, it is there to stay for many years; there is no way a hotel man can curb his production. He can increase it, but he cannot decrease it.

The 1928 Situation. This over-built situation had become so acute by 1928 that hotel associations and hotel publications began to actively discuss ways and means of combating it. The chief difficulty lay in the lack of basic total statistics regarding the hotel business. The federal government had never seen fit to identify hotels as a separate entity in its statistical compilations of business facts, with the result that the size of the hotel business, the capital invested in it, its annual turnover, number of employes, and so forth, were largely matters of conjecture.

The Investigation. In March, 1928, editors of *Hotel Management* conceived the plan of having a fact-finding survey that would disclose such data as we just mentioned, made by an independent and reputable organization, whose recommendations, as based on its findings, would carry weight with the investing public and with the other groups interested in hotel projects. The Engineering-Economics Foundation, a post-graduate college of Boston, which specializes in ascertaining and disseminating fundamental economic facts to men in business, was selected for this purpose. The financial sponsors of this survey were the Bowman-Biltmore Hotels Co., Eppley Hotels Co., Hotel Astor, Hotels Statler Co., The Savarins, Inc. and United Hotels Co. of America. Much credit is due these organizations for their generosity in advancing the fee the Foundation requires for all such undertakings as this for a cause in which all hotel men benefited equally.

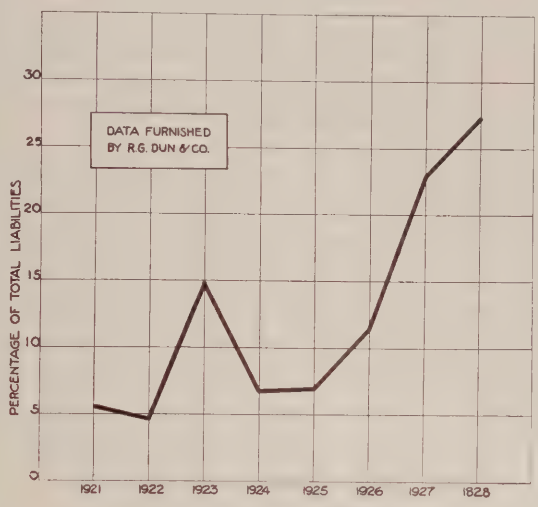
A committee of 18 practical hotel operators was organized for the purpose of defining the



RELATIVE NUMBERS 1920=1000

YEAR	RELATIVE NUMBER	YEAR	RELATIVE NUMBER
1919	859	1924	1095
1920	1,000	1925	1090
1921	1,077	1926	1093
1922	1,085	1927	1090
1923	1,085	1928	1093

The Trend of Room Income for European Plan Transient Hotels. Room Rates Have Not Changed Recently



YEAR	NUMBER	LIABILITIES	PERCENT OF TOTAL LIABILITIES
1921	59	$2,629,362	5.5
1922	70	2,234,104	4.6
1923	82	7,128,901	14.8
1924	64	3,182,779	6.7
1925	82	3,323,069	6.9
1926	82	5,505,928	11.4
1927	112	10,982,263	22.8
1928	112	13,153,899	27.3

The Trend of Hotel Failures Shows a Steady Increase. The Other Charts Indicate Reasons for this Trend

scope of this investigation and advising with the Engineering-Economics Foundation from time to time. The fact-finding part of this investigation occupied virtually a year's time. This period had been established in advance, due to the fact that all the interests involved realized that the Foundation would have to work in a virgin field. The accompanying charts are representative of the fundamental economic information developed in the course of this survey, and the statistics they give are the first authoritative trend data developed for the hotel business. These charts, in the form of reprints of progress reports on this survey, were published in *Hotel Management.* The final step in this last, or "fact-disseminating," stage of the survey will be the publication, in January, 1930, of a book "Promoting New Hotels,—When Does It Pay?" by Harper & Bros. This volume will give the results of this year of original research in detail, with particular reference to the community hotel promotion problem.

Recommended Procedure. Of the overbuilt situation, Dr. Hollis Godfrey, President of the Engineering-Economics Foundation, writes:

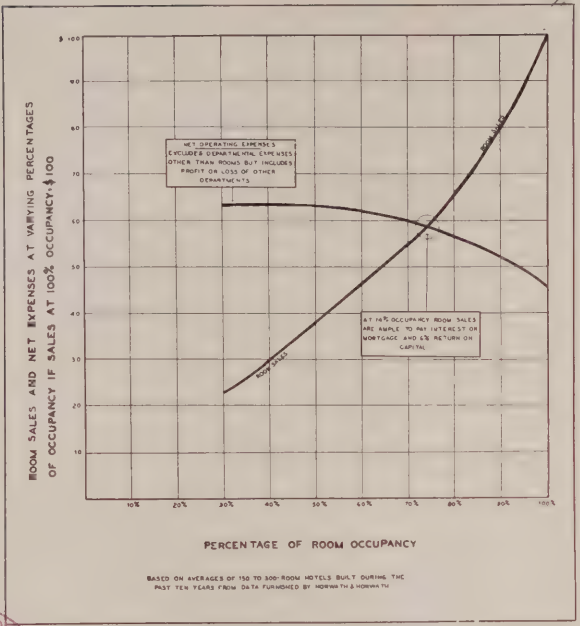
"Now that the Foundation's study of supply and demand in hotel rooms has been brought to a conclusion, and the facts this study brought to light have been transmitted to the interested groups through your publication and other media, I feel confident that the Foundation's staff will be entirely safe in emphasizing our original tentative recommendations with regard to the serious economic status of this business wherever, in the course of our contacts with other business fields, we feel that they may prove of value. You will recall that these were:

"First,—That city hotel associations whose members are threatened with the over-construction menace conduct a survey similar to that recently carried out by the Hotel Association of New York.

"Second,—That before any new hotel is financed a detailed and unbiased survey be made by qualified and experienced hotel experts and accountants, and that prospective investors be urged to request all such information as this and to consult with their bankers regarding the investment.

"Third,—That hotel and allied interests insist upon a stricter enforcement than is at present exercised of the laws regarding the issuance and sale of real estate bonds, to the end that inflated appraisals and speculative securities will be eliminated from hotel financing."

Findings of Investigation. Architects will be vitally interested in the findings resulting from this survey for two important reasons. In the first place, because the hotel business at large has



BASED ON AVERAGES OF 150 TO 300-ROOM HOTELS BUILT DURING THE PAST TEN YEARS FROM DATA FURNISHED BY HORWATH & HORWATH

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Profit Trend with Varying Percentages of Occupancy. European Plan Transient Hotels Only

of late found itself in a precarious condition due to over-building, architects will want to be particularly careful henceforth, when they are asked to design new hotels, to ascertain insofar as possible in advance whether there is a real need for a hotel of the size and type contemplated in the proposed location. Otherwise their prestige will suffer, for no architect who has his future to consider can afford to identify himself with a building that becomes a failure financially,—no matter how well it may have been planned.

In the second place,—and particularly in the smaller centers,—architects are frequently asked to accept stock in new hotel ventures as part or all of their fees for designing them. In such cases it is obviously of direct interest to architects to analyze the proposed hotels' profit possibilities. A careful survey of any proposed hotel's profit possibilities should be made in advance by competent and unbiased experts. I have been given access to a number of reports of this kind, and it is surprising how close their predictions have come in most cases to the actual operating experiences of hotels for which they were made.

There should be borne in mind the fact that it was never the purpose of the Foundation's survey to indiscriminately discourage the building of all new hotels. The hotel business is great and growing,—and has unquestionably become better stabilized in the last six months. Horwath & Horwath, hotel accountants and consultants, whose experience and statistical resources were of great value to the Foundation in the course of this investigation, issue a monthly bulletin showing the aggregate business of their hotel clients. For the past six months this report has shown that this year's business has been from 1 to 4 per cent *better* than the corresponding month of 1928, whereas during the same six months of 1928 the same group of representative hotels reported a total volume of business that was from 2 to 8 per cent *worse* than for the corresponding months of 1927.

Airports. The great number of airports (over 2,000, according to a recent estimate) that are now in operation or in process of construction throughout the country offer unique opportunities for new hotels in many instances, although it should be very carefully ascertained in advance in each case how well the hotels in the adjoining communities are equipped to serve the new classes of patronage that these airports are creating. The apartment hotel field is one which will bear careful scrutiny by the far-seeing architect. According to many authorities, developments of this character are still in their infancy, and it is a fact that the "apartment hotel idea" is spreading very rapidly from the larger to the medium sized cities throughout the country.

Modernizing. In my opinion there is an even greater opportunity for creative architectural service in the remodeling and redecorating of existing hotels of all types. Hotel men have come to realize that the best method of staving off competition from further new ill-advised hotels is through the modernization of their buildings, both interior and exterior. The architect who can make a presentable structure out of the "Early Yapank" type of hotel, which now dots our cities all too thickly, will indeed establish himself as having marked ingenuity and artistic skill. The financing of hotel remodeling operations is usually less of a problem today than the raising of funds for a new building.

Recent investigations (by Horwath & Horwath) have shown that the hotel business now ranks seventh in the United States in point of capital invested and number of employes. So long as its growth is directed along the proper lines, it will continue to grow in profits and prestige, for travel is tremendously on the increase, and "bed and board" are necessities which no traveler can do without. Because of their high ethical standards and detached viewpoint, architects are looked up to as leaders in all civic developments. For this reason they can do more than any other one group to guide the hotel growth of their communities into the most profitable and permanently safe and sound channels.

MAKING HOTELS FINANCIALLY PRODUCTIVE

BY

PRESTON J. BRADSHAW

ARCHITECT, OWNER AND OPERATOR OF THE CORONADO HOTEL, ST. LOUIS

THE hotel project as a product of the architect is purely an economic problem. This includes the relationship that design and artistic success may have with it. It is a financial product and exists only because of its ability to produce financially. It becomes a concrete product through the coördination of the owner (or let us speak of him in terms of his mouthpiece, the operator) on the one hand and the architect on the other.

As for the selection of the architect, he may be selected for his ability and experience in this particular line of endeavor; he may be selected because of his influence with the money interests or other similar controlling factors; or because of his natural ability as a salesman to interest the owner in his services. And he is usually chosen for either of the last two reasons. This architect generally thinks of his project only in terms of a facade and a typical plan. The first is usually stereotyped, and the latter a stock idea. He thinks only of a row of bedrooms with baths behind this, back to back in the accustomed manner. Having settled these two phases of the project, he is perfectly satisfied with it and considers the remainder of the work something which will just naturally work out. And actually, he has not even begun!

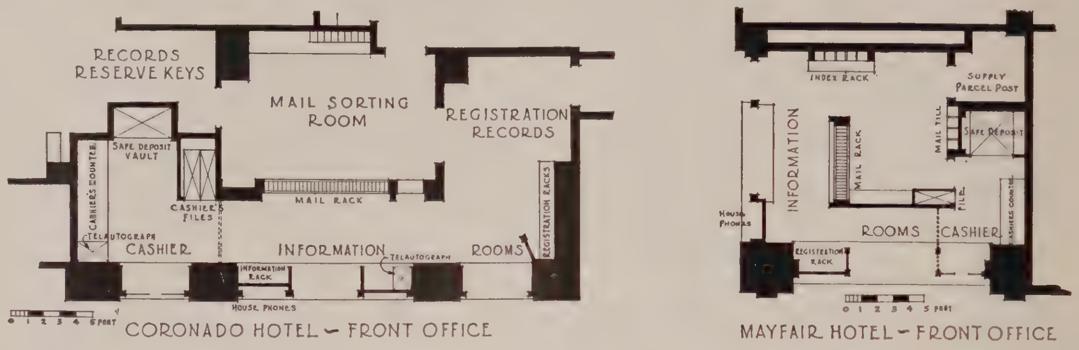
A horse racer, placing his hopes upon his horse to win the race, assures himself first of the jockey's understanding of the horse, and so it should be with the selection of the architect. The hotel product in its embryonic state evolves from certain visionary ideas in plans of the owner which the architect must mould into a physical mass of perfection from a viewpoint of beauty and productivity. So it is apparent that the architect must join in unison with the operator. He must realize that every portion of this work down to the smallest detail has some bearing on the success and operation of the hotel. Let us then, as an architect, remove our professional cloak and work in terms of the operator.

The hotel is defined in several ways: as a house for entertaining strangers or travelers; as an inn of the better class; as an abiding place of persons who are lodged with or without meals. Fundamentally the hotel is a domestic establishment. It will succeed only in proportion to its ability to provide domestic services and homelike convenience and environment. This enterprise can become profitable only when this purpose is fulfilled,—considering the guest from the moment he enters the establishment until he again passes through the door on his departure. All this service in terms of financial productivity is brought under three divisions: rooms and their service; food and its dispensation; and auxiliary service which incorporates the various remunerative services which the guest may desire. All other functions of the hotel exist only as subservient to one of these. Depending upon the type and size of the hotel, these functions vary in importance and extent. Let us consider only the normal transient hotel of 300 or 500 rooms.

Room Service. Furnishing guest room service is the primary and foremost purpose of the hotel. The moment the guest enters, the necessary service is in motion to accommodate him in as efficient and expeditious a manner as possible. Proper planning is absolutely essential for the delivery of this service to the patron without interruption, if the good will of the guest is to be obtained and held.

The Front Office. Let us consider first the desk or front office which is actually the heart of the organization. Strangely enough, the details of its operation and the equipment necessary are usually left to the last minute, with the result that the management must often re-adjust and install equipment after the hotel is in operation. In the medium-sized hotel the desk is usually divided into three sections,—registration for rooms, information, and cashier. Modern devices have greatly simplified the working conditions of the office, and their consideration is essential in the planning of the layouts. One of them is the telautograph or similar system which serves as the means of communication between the various departments, marking the arrival and departure of guests, the handling of charges, etc. It is desirable to sink the telautograph machine into the counters of the office so as to be level with the tops of the desks. Then there is the pneumatic tube system which is particularly necessary in the larger hotels. Charge accounts and C.O.D.'s. must reach the cashier immediately on execution, and in the larger hotels where certain departments are far removed this is quite important. Space must be provided in the cashier's cage for this service. There is also the cash register accounting machine, which has been adopted almost universally for the handling of accounts, because of its accuracy, speed, safety, economy, and the cleanliness of statements when presented.

The cashier's cage must have sufficient working space with a counter adjoining the desk. The proper space must be given the safe deposit vault, which should be placed in direct view of the guest



Front Offices of Two Hotels Arranged for Efficient Service
Preston J. Bradshaw, Architect

standing at the cashier's window. There must also be space for the guest credit files, which in some hotels reach very large proportions. These three essential departments of the office must properly incorporate and consider all the factors previously mentioned. They should be properly arranged with respect to one another, involving a minimum of lost motion. The accompanying floor plan of the Coronado Hotel front office is an excellent example incorporating all these requirements. It has proved very successful in operation; it is large enough to handle the maximum amount of business and yet sufficiently compact to be controlled at night by a minimum number of clerks. The essentials in the planning of the office are of necessity compactness, ease of operation, and service to the guest. The Mayfair Hotel layout is a particularly compact plan; however, it is not called upon to do the large volume of business which the Coronado Hotel office is required to do.

Typical Floors. Let us follow the guest to the typical floor. We will not attempt in this article to delve into furnishings, carpets, or fixtures, which are all in another realm of planning and maintenance. We might assume that an economical plan has been evolved, obtaining desirable rooms throughout. The exact grouping of furniture must always be considered in determining the possibilities of the room. It is not necessarily the square foot area that results in the desirability of the room, but rather the grouping of the furniture in relation to the shape of the room.

The question of materials and equipment for the typical guest room and bath is usually not thoroughly investigated and understood. However, the question of maintenance is directly involved. The painting of walls with a zinc paint not too roughly applied is most satisfactory, especially in cities where the smoke nuisance is a great evil. The walls can easily be washed, and if the shades are soft, the resultant appearance of the room can be made very pleasant and homelike. A full-sized mirror is essential in every bedroom. Enough electric outlets must be provided. These should be placed to conform to the pre-arranged furniture grouping. Radio equipment must be considered. The head-phone sets are not the most desirable. In their stead, we have arranged a built-in unit in the closet with a disc loud speaker placed behind a register at the ceiling. This eliminates pilferage of the sets on the part of the guests.

Bathroom Equipment. The bathroom should have a marble threshold to withhold water that may reach the floor. A stationary ice water faucet over the lavatory is better than a swivel type, as it prevents careless leakage. A full-sized medicine cabinet is preferable to a mirror and shelf. A pin rack is more desirable for towels than a flat rack. Pulling a towel hurriedly from a shelf usually causes the whole supply to fall. An ordinary 75-watt light on the medicine cabinet should be sufficient illumination for the bathroom, but by all means it should be controlled by a switch. It will save untold activity on the part of the engineer in replacing pull socket chains. There should be an electric socket near the medicine cabinet for the use of curling irons. These are some of the innumerable items which must be considered from the viewpoint of the operator and which are usually overlooked or not considered.

Floor Services. The typical floor should also have the necessary service in connection with it. The need of adequate helps' closets on each typical floor is imperative. There should be a maids' closet containing the slop sink, and also a toilet; the housekeeper will have better control over the maids if they can remain on the floors to which they are assigned. The linen closet should be large enough to provide an adequate supply of linen, carpet sweeper, hairbroom, and supply baskets. There should be a telephone in each with buzzer signal and a light indicator to the corridor to be easily visible to the maid. It saves the housekeeper many steps and gives her the means of notifying the maid of check-outs. In most cases the service hall is of necessity very small, and the noise connected with it very objectionable, due primarily to the slamming of elevator doors. It is desirable to soundproof the ceilings of these halls. The service doors should have ball-bearing hinges and door checks.

In conjunction with the guest room service, there is the proportionately large organization in the "back" of the house which is necessary to produce and maintain this service. There are the departments under the control of the housekeeper, those under control of the engineer, the storage rooms, work shops, locker rooms, and print shops.

Important Storage. Large amounts of money are dissipated by many hotels because of the lack of storage spaces for the various departments where seasonable merchandise must be stored. In planning the hotel the architect usually is cramped for space when he begins to lay out the mechanical equipment and service rooms, and consequently the locker rooms and storage rooms usually suffer. It is well to keep in mind the great amount of waste which results from the improper storage of furniture. Every hotel should have an adequate furniture storage room. This item is too often omitted from the plans. The room should be large enough to store all the wicker furniture which is used either on terraces or in the lobbies, couches and chairs waiting for the upholsterers, bed ends, proper shelves for mattresses and racks for box springs, baby cribs which are usually kept on hand, and various other items necessary for the proper operation of a first class hotel. In conjunction with this, there should also be the upholsterer's shop, paint shop and repair shop. In a 500-room hotel it requires two upholsterers, starting a year after the opening of the hostelry, to keep pace with the deterioration of the upholstered furniture. Gas is usually provided in this department for glue pots, and various electric outlets are necessary. There should also be rack space with dustproof doors for the upholstering material.

There should also be a paint shop for the storage of paint, and also shelves and racks for the painting of screens, waste paper baskets and other such items as come under the painter's jurisdiction in addition to his wall work. The furniture refinishing room should immediately adjoin this shop, so that men can work in either department, depending upon the amount of work on hand. This department can become economically a very successful department, as I have learned from experience. On one occasion I was charged $1.50 per chair for the refinishing of 600 chairs which consisted of sandpapering, one coat gold lacquer, and one coat clear lacquer. Later I had a refinisher at a salary of $165 per month to refinish the same chairs at a cost of 35 cents each. This type of economy is possible in any hotel if the space is provided. I have found that having these departments, properly set up with the correct equipment, is an incentive for the manager to keep his furniture in good order, and at a minimum cost.

The carpenter shop should also be placed with this group. It should be of sufficient size for the storage of lumber, panel stripping, and crates. Practically every good sized banquet or convention requires special carpenter work, platforms, etc., the hotel profiting by using its own men and charging the guest.

It is desirable to place these allied service departments under the main roof, primarily because of the economy of this area if incorporated with the pipe and duct spaces, but also because of the available light and air, and the isolation from the rest of the building.

Housekeeper. Let us give the housekeeper's department its due consideration. A great amount of money can be saved if this department is arranged properly. There must be an intelligent spacing of the tables, shelves, and bins for the sorting and mending of linens. Space should be provided for the handling and storing of winter blankets, hangings, and rugs which are stored during the summer months. We must remember that the housekeeper must have under her immediate control the complete inventory of the "live linen storage" and the reserve. If the house is to include a laundry, it is advisable to have the linen storage, sorting, counting, and housekeeping department grouped with it to minimize passing the linen to and from these rooms. A laundry is a very desirable investment in any hotel operating above 400 rooms. It will save the hotel in the immediate cost of operation as well as in the saving of the linen.

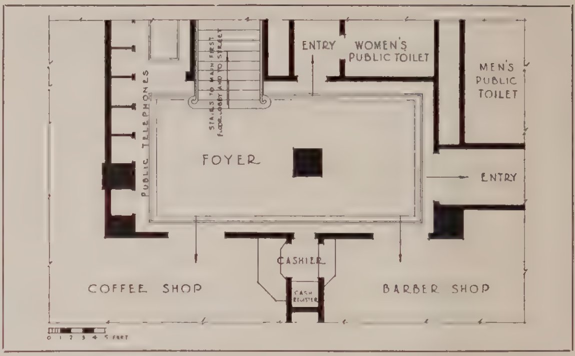
Food Service. From the viewpoint of the owner, the food service should be the most important part of hotel operation. It is the most dangerous and may be the most disastrous from the financial point of view. Many hotel operators will disagree with me and minimize this statement. With the construction costs of hotels mounting to such high levels in recent years, and with the room rates on such a competitive basis, a hotel can survive only if it looks upon its food department as a source of profit.

The planning of the kitchen, the type of dining rooms, the extent of service, and the kind of equipment form an inexhaustible subject and vary greatly with local conditions. However, we can strike certain notes of warning and guidance that will assist greatly in an economical scheme and bring forth matters not always considered. We cannot say what kitchens are necessary or just how they shall be arranged. Every individual, no matter how experienced, has individual views which will not agree with those of another. My experience in employing chefs is that no two have the same ideas, so I have adopted a system of planning according to my own conclusions, and those connected with its operation will agree that it is in accord with their ideas.

Usually, with disastrous results, not enough space is left for the kitchen service, and the necessary equipment cannot be included. On the other hand, a kitchen may be too large and unwieldy to produce economical results. It is very true that a small crew in an ample space is more efficient than a large crew in a small space. The keynote of kitchen planning is centralization. It must produce a compactly arranged main kitchen with its secondary departments controlled efficiently from it; it must consider accessibility to the supply or steward's department; it must control the various lines of traffic necessary to operate the department; it must solve the important dish problem; it must, above all, take into consideration room service and banquet service.

A kitchen is normally provided with abundant range space, but is very seldom given sufficient refrigerated box area. After all, boxes are not expensive when properly grouped. The *garde manger* should have sufficient space for salads prepared in advance, dressings, cleaned fruits, cut butter storage, and numerous other items. A smaller crew can capably handle the peak load if there is sufficient space to store such dishes as can be arranged ahead of time. There should also be a refrigerator for the chef to store his prepared soups and vegetables. The *garde manger* counter should have iced *bain maries* of sufficient size and refrigerated space for cold plates and salad bowls. Similarly, the cook's section must have adequate hot *bain maries* and abundance of heated space for hot plates.

It is desirable to place the bakery and ice cream department close to the main kitchen; if not, it should be placed directly under the pantry where a dumb-waiter can operate between the two. The bakery should have long bins with marble tops in close proximity for the storage of raw materials. In addition, there must be wooden trays and kneading boards for the bread department. Electric ovens have been found very satisfactory. The ice cream department should have a good sized freezer box with direct expansion coils acting as shelves. This space is often made too small where large banquets may have to be served. Bulk ice cream is kept in racks with sufficient capacity for at least 50 to 70 gallons' storage.

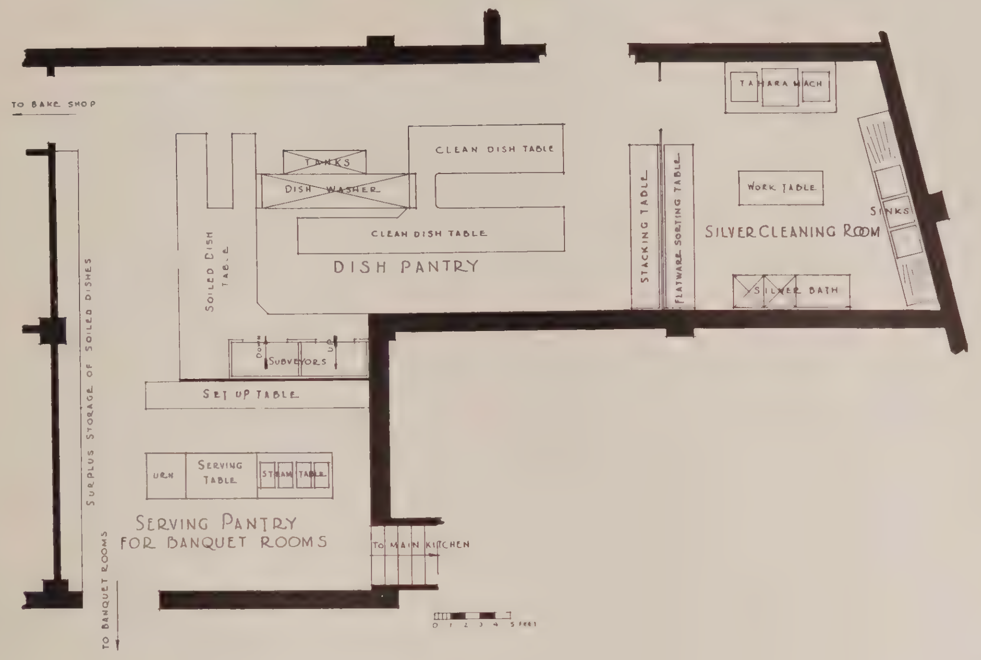


Basement Foyer of the Lennox Hotel, St. Louis
Preston J. Bradshaw, Architect

Consider the amount of motion saved if the store room can adjoin the kitchen. Here sufficient shelf space is provided for week-to-week canned goods, bottled goods, and all the other staple lines of food. It is in reality a complete grocery store under the control of the steward. If possible, the refrigerator storage boxes should lead off of his room, as they are also under the control of the steward. These boxes should be as large as possible to permit of greater buying volume. A bulk storage room may be placed on the larger level for barrel and case goods. Space should not be overlooked for the storage of china and glass. All these rooms must be directly under control of the steward, and everything for which he is responsible.

The dish pantry is always a problem. I have found it very desirable to place this department on the lower level from the kitchen. It takes the dirt and noise out of the main work room and permits of better storage of soiled dishes resulting from rush periods. There will be a consequent saving of labor if a smaller crew can operate continuously throughout the working day without choking the system. With the perfection of conveyors, it is really simpler than it sounds. At the Coronado Hotel, the dish pantry was part of the main kitchen, but later it was moved to the basement and operated from subveyors with much success. A layout of this room is presented herewith. If the dish pantry cannot be placed in a separate room, it should be well soundproofed.

When the general plan is decided, and the elevators and kitchen locations settled because of certain limiting conditions, let us hope that they are sufficiently close to each other to provide effective room food service. A proportionately large amount of revenue can be derived from this service, as an increase in price is made over the usual dining room charge. The space for room service should by all means be placed as close to



Plan Showing the Dish Pantry, Silver Cleaning Room and Serving Pantry of the Coronado Hotel, St. Louis
Preston J. Bradshaw, Architect

the service elevator as possible. One elevator should be set aside during the busy food periods for the exclusive use of this department. With this convenience, a waiter can make a complete trip in 10 or 15 minutes. The room should be large enough for 15 or 20 service tables, charcoal burners and a desk for checker or order clerk.

Where the banquet rooms are located on the same floor as the main dining room, a banquet department can easily be arranged with little expense as an adjunct to the main kitchen. It will require a long, low counter, one end equipped for hot plates and the other for cold service. Sufficient refrigerated space is necessary for the storage of fruit salads or desserts, which must all be prepared ahead of time. In connection with the hot service a hot *bain marie* for soup containers and two large broilers, which will take care of most banquets of up to 500, will suffice.

Shops and Services. In the general planning of the hotel there become involved all the auxiliary services which the operator should depend upon for their proportion of the revenue. In this respect he must look upon himself as a merchant surrounding himself with a maximum number of sales opportunities. Many operators do not realize this. Such departments as the barber shop, cigar shop, flower shop, and telegraph concession can become very profitable adjuncts. One must always consider the psychological effect upon the guest in locating them with respect to his environment. Strangely enough, in the Coronado Hotel the cigar shop is not anywhere near the main lobby but is located in a shop corridor adjoining which is a broker's office and which leads to the popular coffee shop. As a result, this counter does a large volume of business, and due to its location it also handles the checks for the coffee shop. The Lennox Hotel presents a successful grouping of such interests. One would not normally consider the basement a successful location for a barber shop in this particular project. But the successful grouping of shops serving allied purposes around a public basement lobby which serves as an entry to the coffee shop, popularizes this location. This lobby has a spacious stairway leading directly to the street and also to the lobby. In the accompanying plan of this grouping, note also the combination cashier's desk serving both the coffee shop and barber shop.

The entire procedure in the operation of the hotel is to economize as much as possible, and yet satisfy the guest. For, after all, a hotel exists only through the patronage of the guest, and whatever may be necessary to attract and invite this individual is a desirable investment. It includes such details as exterior illumination, brilliant furnishings, fixtures and decorations.

ANALYZING HOTEL FINANCING METHODS

BY

PAUL SIMON

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IRRESPECTIVE of the beauty of a hotel, the architect's reputation will not gain if, from a cold blooded business point of view, the hotel's operation cannot result in profit. It may seem at first glance that the architect cannot possibly and should not be held to blame for all the factors entering into hotel operation entirely outside of his control and of his immediate responsibility.

In this paper we are not concerned with possible errors in layout, which may have caused increased expenses of operation or curtailed convenience and comfort to guests. We also do not want to go into the serious but frequent blunder of erecting the wrong type of hotel in a given location or under certain given conditions, but we do want to consider that hotel where the architectural structure is all that it is supposed to be, but where the financial structure is such that economic success is endangered.

Fees in Stock. Every hotel building, residential or transient, is a special building, usable ordinarily only for the one purpose for which it has been planned, and there is at least a strong moral obligation on the architect's part to be reasonably certain, that with proper management, the enterprise has a fair chance to succeed. This moral obligation becomes stronger in ratio to the closeness with which he has been in contact with the beginnings of the enterprise, and it is most pressing where and when,—as is so frequently the case,—the architect has been the,—or one of the,—promoters. In many cases he has to accept part or all of his fee in stock or other securities of the hotel and is expected to make arrangements of a similar nature with contractors.

"Value" and "Price." In all cases it behooves the architect to keep in mind that even the finest, most durable and well balanced construction may crumble under the load of a financial super-structure which is too heavy a burden. If a hotel building is erected, a new value is created. This "value," however, is not necessarily equal to the "price." The building may be worth in material and labor all that it has cost, and still be a liability rather than an asset, if the operation does not yield a proper return on the capital and in addition does not return the original capital during the economic (i.e., useful) life of the building.

Fundamentals of Financing. It is essential to limit ourselves in this article to the consideration of the most fundamental aspects of hotel financing which, however, must include an understanding of the hotel industry. It is a fact that 100 per cent occupancy over even a relatively short period of time is an impossibility in hotels, and percentages of occupancy exceeding 90 per cent (as found in office buildings under advantageous conditions) are extremely rare even in apartment hotels where leases of a year or more are demanded. In transient hotels, experience shows that an occupancy exceeding 70 per cent over a period of a year or more is the rare exception.

When arranging for the financing of a hotel, bonded liabilities should not exceed the point where the annual obligations arising in connection therewith exceed the earnings which will be available under the most conservative expectations regarding occupancy. In the case of transient hotels, the danger line is rarely lower than 60 per cent. It follows, therefore, that the amount of the first mortgage cannot be safely determined simply by measuring it in proportion to the total cost of land and building, and that the ratio of the interest and principal payments to the expected earnings is the more important factor.

Earnings' Ratio to Interest. Investment bankers and security commissions usually want the estimated earnings available for interest to equal from 2¼ to 2½ times the maximum interest. In the cases of hotels constructed and financed in recent years, the available earnings have attained that proportion in relatively few instances. The most frequent causes for the actual results falling short of those anticipated were:

1. Hotels built in excess of actual needs.
2. Mortgages too high in comparison with possible earnings, even if in proper proportion to the value (price) of the assets.
3. Principal payments too high or starting too early.
4. Over-estimating volume of sales.
5. Under-estimating operating expenses.

All five reasons strongly point to the necessity of there being a thorough and unbiased survey before arrangements for financing are made. Many times an extra story or two, an elaborate banquet room or other facilities and accommodations in excess of practical need have increased the cubic contents, and consequently the cost, and finally the borrowed capital to a point where the burden became too heavy.

The higher the mortgage the greater, of course, become not only the interest but also the amortization payments. These payments must be met, to avoid foreclosure or dispossession, and many a good hotel project has been wrecked because the management, in fear of this sword of Damocles ever hanging over its head, busy to scrape together the money necessary to meet the payments, was afraid to make essential expenditures for promotion or upkeep and maintenance.

Bonded Debt and Stock. In financing a hotel one of the prime rules ought to be to keep bonded indebtedness at a level sufficiently low, so that all obligations in connection therewith can be met, even under the most disadvantageous conditions. If further financing is necessary, such requirements should be taken care of by the sale of "income debentures," or of some type of stock issue. It is the modern trend to combine such junior financing with privileges of conversion into common stock or with a bonus of common stock. A combination of this kind is logical and practical; logical because the greater risk involved entitles the purchaser to a share in the possible eventual greater profit, and practical because its salability is increased through the appeal to a public with increasingly speculative instincts.

Typical Financing. If we assume, for the moment, that the hotel is exactly right, i. e., that it fills a need in the community, that its size, layout character, appearance, type and location are 100 per cent good, that the management is capable and efficient and that, therefore, the volume is in proper proportion to the available accommodations, and that the operating profits are in the proper proportion to the volume (all of which is quite a presupposition), then we can arrive at imaginary ideal ratios of the various types of financing to the related types of investment.

This table shows a normal ratio of the various assets of a hotel to the total investment:

Land	21.00%
Building	59.00
Furniture and Fixtures	13.50
Deferred Charges and Prepaid Expenses	1.00
Current Assets	5.50
Total	100.00%

Correspondingly, we give listed here a typical set-up of the means of financing the requirements as found in recent hotel projects:

First Mortgage Serial Gold Bonds	52.00%
Second Mortgage (payable in five years)	24.00
Unsecured Notes	5.00
Stock (preferred and common)	19.00
Total	100.00%

The type of financing just outlined shows that the First Mortgage Bond issue equals 65 per cent of the value of land and building or 52 per cent of the total requirements, which is the usual proportion, but since the actual investment, as represented by the outstanding stock, equals only 19 per cent of the total financial requirements, it is necessary to obtain further financing by arranging a second mortgage and, in addition thereto, evidently part of the furniture and equipment purchases has been paid by notes. These notes necessarily are unsecured notes, because the investment house underwriting the first mortgage issue generally and justifiedly insists upon clear title for furniture and equipment, the reason being that, in the case of a foreclosure, the uninterrupted conduct of the business would be jeopardized if a third party had title.

The great danger in financing of this type is that, not only interest, but also principal payments on second mortgage and notes must be met during the initial years of operation. Even under the most advantageous conditions a new hotel requires a period of seasoning and ripening and finds its stride only very rarely before the third year of operation. Since the construction period consumes generally at least one year, a normal business cannot be expected sooner than four years from the date of the issue of the mortgage loans. It follows, therefore, that even if in later years the hotel might be able to carry the burden, the first few years would probably end in disaster. *A hotel consequently cannot be considered to be soundly financed if heavy payments are obligatory in the first three or four years.*

Inasmuch as a first mortgage usually cannot, and should not be secured in excess of 65 per cent of the combined value of land and building, and inasmuch as these items equal approximately 52 per cent of the total financial requirements, sound financing would call for more than 19 or 20 per cent of owner's investment. The difficulty is that the rate of return is hardly sufficiently attractive for a cash investment of nearly 50 per cent without security greater than that offered by capital stock.

To see just what that means is easily shown by a simple example of arithmetic. For example, an operator or an operating corporation has in mind the promotion and erection of say a 100-room hotel, and this hotel, including land, building and equipment is to cost $600,000. The earnings, before interest and depreciation are deducted, are expected to be $60,000. If $500,000 of the total investment is borrowed at an interest rate of 6½ per cent, amounting to $32,500 per annum, the profit available for depreciation and dividends would be $27,500 or 27½ per cent on the owner's actual investment of $100,000. If $300,000 were borrowed, even at the lower interest rate of 6 per cent, amounting to $18,000 per annum, the return available for depreciation and dividends would be $42,000, representing 14 per cent on an investment of $300,000. Thus, the inclination of the borrower to obtain mortgage loans just as high as possible, is not unnatural, even though it is dangerous and has led generally to failure, because in the case of the $500,000 loan, the cash requirements would amount to 6½ per cent for interest plus 2½ per cent for reduction of the capital indebtedness, or $45,000. That proportion to earnings usually is not only too heavy a burden in the initial years, but involves great risk in any later year when, as happens in any industry, a lean year or a period of lean years has to be weathered. The experience of the last few years has seen full proof of this fact.

The consequence is that numerous hotels have been taken over by trustees for the bondholders. Equities of the owners (stockholders) are wiped out in most of these cases. Creditors on open accounts have only slim chances of recouping, and in certain cases it is rather doubtful whether or not 100 per cent of the first mortgage bonds can be recovered. In most cases so far the purchasers of first mortgage bonds have not lost either principal or interest, where bonds were bought from the very high class investment houses, because those investment bankers of high standing and very strong resources, so far, have protected them and are carrying the burden.

However, even these strong institutions naturally have their limitations, and as a consequence they have shut tight, and it is very difficult indeed today to find underwriters for first mortgages even for meritorious hotel projects. That condition, as far as existing hotels are concerned, is to be welcomed, because there is no doubt that in most parts of the country, the industry has been overbuilt. It also has the further advantage that most probably it will lead to sounder financing when the market opens again.

An ideal plan of financing a hotel project amounting to $1,000,000 would be:

Cost of Land		$200,000
Cost of Construction (including architect's fees, contractor's commission, surety bond, etc.)		600,000
Interest for Temporary Loan during Construction, 6 per cent on $600,000		36,000
Furniture and Fixtures		124,000
Taxes, Other Expenses, etc.		40,000
Total		$1,000,000
To be financed in this way:		
Institutional Mortgage Loan	$450,000	
(Less: Discount of 3 points and expenses)	20,000	
Net Proceeds		$430,000
Income Debenture Bonds with Conversion Bonds	$300,000	
(Less: Discount of 10 points)	30,000	
Net Proceeds		270,000
Preferred Stock, 1,000 shares		150,000
(One share of common stock given as bonus with each two shares of preferred stock)		
Owner's Investment—Common Stock, 3,000 shares		150,000
Total Proceeds		$1,000,000

The advantages are obvious. To provide (instead of financing as just outlined) a serial bond mortgage issue, sufficient to obtain proceeds of approximately $700,000, the total issue, including discount (higher by about 6 to 8 points than in the case of an insurance loan) and interest during construction, the total loan could not be much less than from $830,000 to $850,000 thereby increasing the cost of the project. Furthermore, yearly obligatory payments for interest and amortization payments thereon would amount to at least $75,000, whereas in the case of a combination of an institutional mortgage, and junior financing, only the failure of meeting the interest on this mortgage (namely $27,000) could result in foreclosure. Usually no, or a very nominal, amortization is required during the life of the insurance loan, and income debenture bonds have as security only the income, so that the danger of a levy against the property is slight indeed. Nevertheless, these debentures should interest the investing public, first because there would be much less danger of non-payment of interest on account of the elimination of amortization on the first mortgage, and secondly because the conversion warrant gives an opportunity of sharing in the ultimate profits in the enterprise in the eventually expected appreciation of the property.

The investment banker usually has a strong aversion against leasehold mortgages. In my opinion, that aversion is not entirely justified. Especially in large metropolitan cities, desirable hotel locations require land so valuable and expensive that sometimes it is almost impossible to purchase it, or if purchased it increases the need for a so much enlarged mortgage, and consequently so much increased capital payments, that we have just that situation against which I have warned in this article. If a lease on such ground can be had on reasonable terms, it means that, in fact, interest only and no amortization is paid.

Financing by land trust certificates means that part of the requirements, which equals the value of the land, is for practical purposes very similar to an arrangement for a lease on the land and a subsequent leasehold mortgage. This form of financing is rather new, used only in a few states to any extent, especially in Ohio.

The architect should realize,—

1. The necessity of a thorough and unbiased preconstruction survey, to arrive at an authoritative estimate of the earnings possibilities of the individual projected hotel, instead of founding calculations of the forecast simply upon average ratios of the industry.

2. The advisability of keeping bonded indebtedness to that low point where even unexpected disappointment in the earnings will not make it impossible to meet obligatory payments.

PLANNING THE HOTEL FOR MAXIMUM FLEXIBILITY AND UTILITY

BY

WILLIAM HULL STANGLE

THE hotel business is essentially an industry; as such it involves the application of the fundamental principles of economics, and calls for their ingenious application by the architect in the design of the hotel. These fundamental principles are founded on experience gained in the operation of hotels and are the factors determined by the natural research of observant operators in the laboratory of the business,—actual experience.

As an industrialist, the operator today buys his room space at a price and merchandises it at a profit. Likewise he purchases raw food, puts it in storage, refines it in the kitchen (for cooking is an art of refining) and merchandises the resultant product in the dining room, coffee shop, grill and other places. The steward is the purchasing agent, the chef the refiner, and the waiter the salesman. The menu is an advertising medium, and the food is sold "ready-made" (table d'hote) or "made-to-order" (a la carte). Shop or store space is sold at a relatively high rate of profit to offset the land-carrying charges, and public spaces are required to insure a maximum return. To do justice to the industry the operator must have a properly designed and well balanced house. The design must meet the demands for maximum flexibility and utility, since otherwise the house is overburdened, and a reduction in profits will result. Proper equipment is of paramount importance. Of the equipment, the elevators and kitchen are the backbone of the hotel. The elevators serve the guest rooms, and the kitchen serves the eating places. The best *parti* will result when the building is designed around the elevators and the kitchen.

Profit. As the hotel must make a profit, it is necessary that the purchase price of the building be in proportion to the possible income. A survey should be made of competing hotels and of the possible patronage, from which the room rates for the proposed hotel should be established. This becomes the first economic factor in the design of the hotel. A cubic foot of space in a given locality will cost a certain unit price. Knowing the possible room rate, an experienced hotel specialist can determine the size of the room and the type of equipment most suitable for the patronage anticipated. The type or character of the house will predetermine the public space requirements.

Standard Requirements. Since there are certain fundamental principles involved in the economic equation, it is logical that standardization be a factor in the design. Several chain operators have found it to their advantage to standardize their requirements. The best of these requirements are used as a basis in this discussion. In most instances the architect, in designing a hotel, looks for a satisfactory typical floor plan. Having achieved this, he designs the rest of the building to suit this typical plan. Let us therefore look into the designing of the guest rooms.

Guest Rooms. The majority of hotels today are high grade commercial houses that a few years ago would have been called de luxe. Again the advanced requirements of the patron have become somewhat standardized, and one must meet this demand. For purposes of reference, typical guest rooms will be designed as C, B, A, AA.

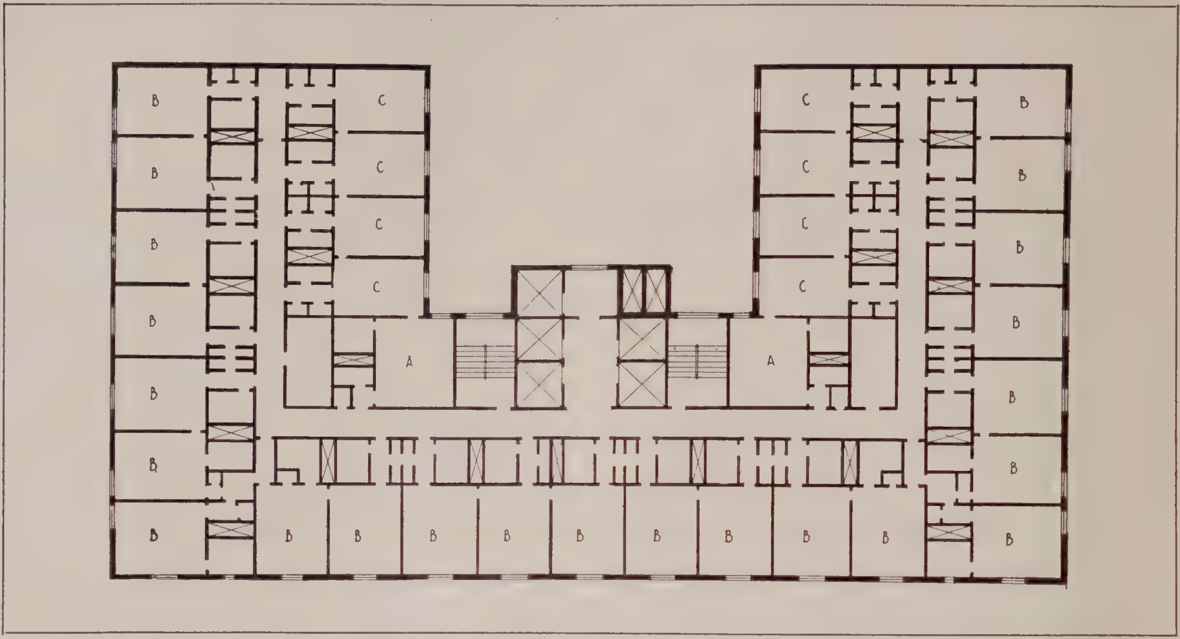
The C room is laid out 9 feet wide and from 13 to 14 feet long, being of ample size for all furniture and space for the guest. A double or three-quarter bed can be used, allowing flexibility in that double occupancy may be had when required, although it is essentially a "single" room.

The B room is 11 feet, 3 inches wide and from 13 to 14 feet long. This will accommodate a double or twin beds with the usual required dresser, side chair, overstuffed chair, night stand and fixtures. A combination dresser and writing desk is used by several prominent operators, saving as it does in floor space and furnishing cost.

The A room is 12 feet, 6 inches wide and from 13 to 14 feet long. This is typical of the B room excepting in the greater width. It is usually furnished slightly more elaborately, and is best arranged as a corner room or as a parlor en suite with a B or a C room.

The AA room is from 12 feet, 6 inches to 14 feet in width and from 16 to 20 feet in depth. This is in reality a de luxe room as is incorporated in the better houses where a substantial resident guest business is anticipated. These rooms are best equipped when closet beds are used, providing a parlor or living room by day and a bedroom at night. This flexibility results in securing a higher rate and resultant increase in profit. The writer predicts that some operator with real vision and a pioneering spirit will some day erect a de luxe hostelry with this type of guest room. It is logical, practical and more refined than the usual "bedroom" guest chamber.

All guest rooms should have telephones connecting through the house switchboard. Where resident guests are anticipated, additional provision should be made for private telephones. Radio in every room is becoming a part of the service to the guest. The writer has recently designed and recommended an elaborate system for

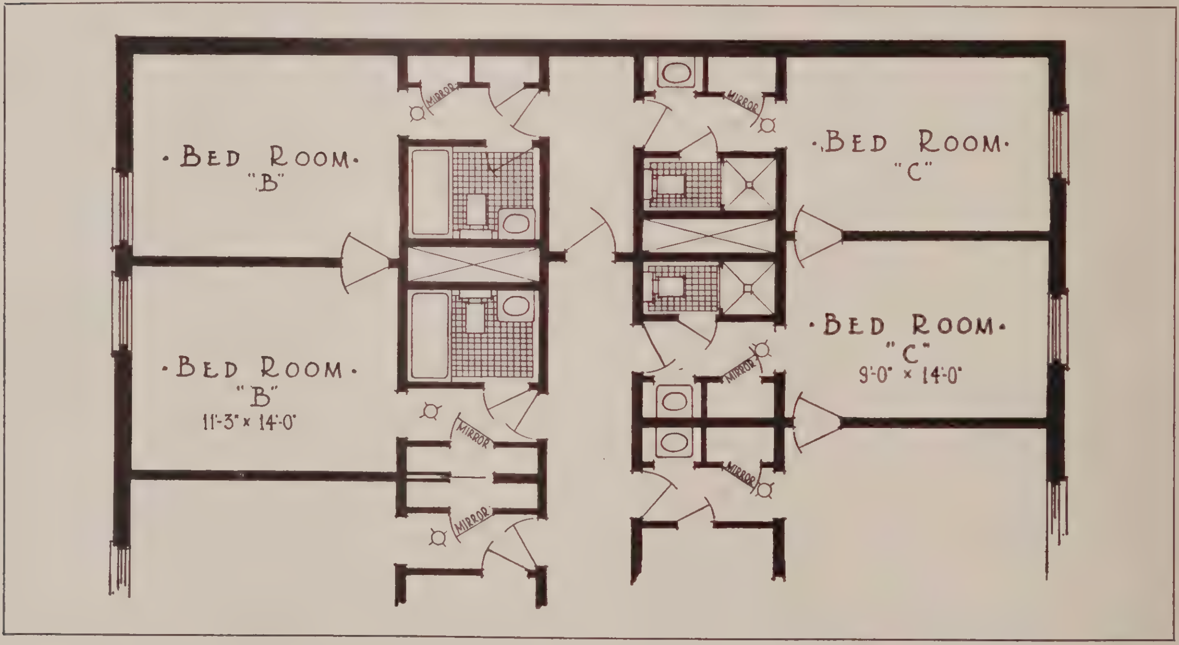


Typical Floor Plan of Hotel Having 32 Rooms per Floor

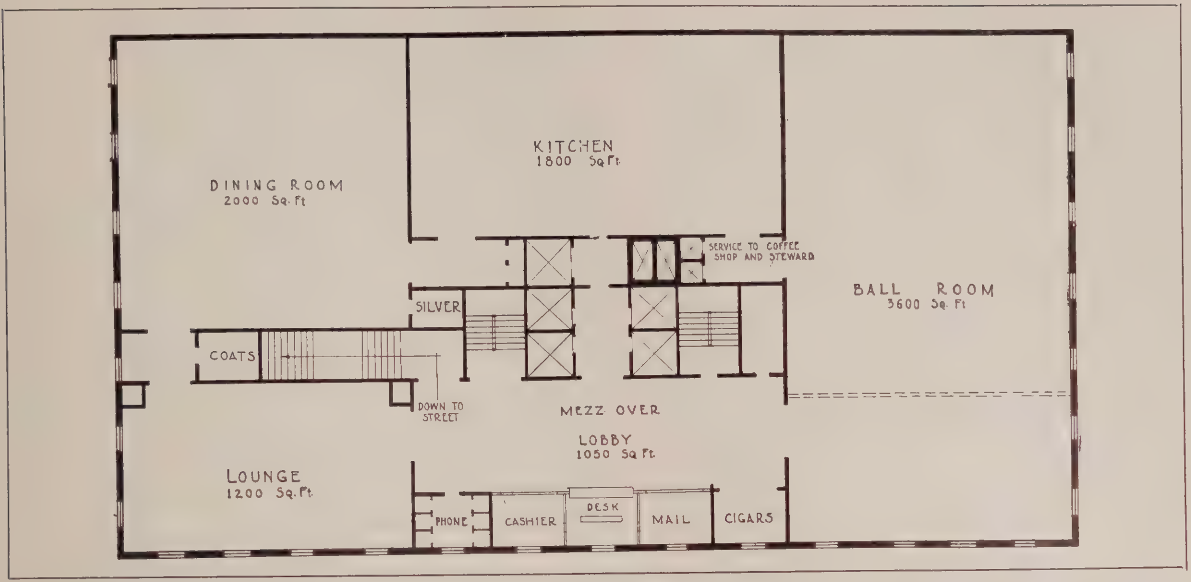
a southwestern hotel providing at least two radio programs,—a Victor record program, and house music,—in every room. This particular city has little theatrical, motion picture, or musical entertainment, and the guest must be entertained to keep him from going to the next livelier town.

Baths. Americans are "bath-minded," and any modern house should have a bath in every room if it is to have distinction and meet the demands of the present patronage. AA rooms should have combination tubs and showers. A rooms should have tub baths and shower heads. B rooms should have at least tub baths, and C rooms at least shower stalls. A few C rooms may, if en suite, have a compartment for lavatory and water closet.

A survey, of course, would indicate the proportion of rooms of the various sizes to incorporate in the design of the hotel. An average for a high grade commercial house would be from 10 to 20 per cent A rooms, 40 to 60 per cent B rooms, and 20 to 30 per cent C rooms. In most



Portion of Plan Showing Flexibility Through Connections. Typical "B" and "C" Rooms and Baths



Main Floor (above Stores) of Hotel Shown on Opposcite Page. Excellent Control and Room Relationships for Flexibility

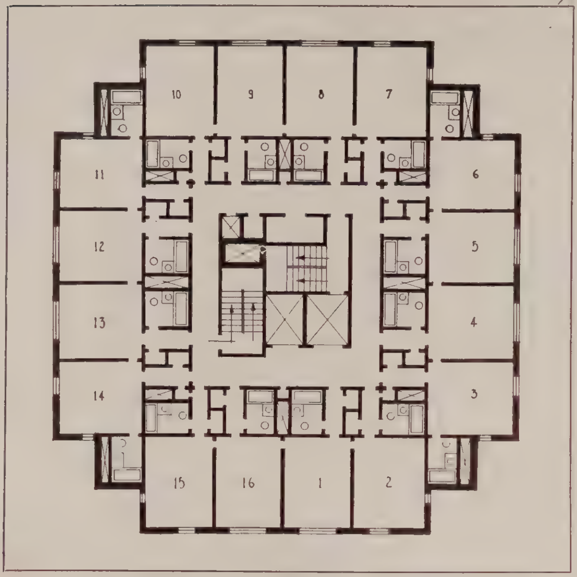
instances, the B rooms are the best sellers and provide maximum flexibility and utility at a relatively lower initial cost. There is a growing demand for shower baths, particularly by men travelers and the younger set of women. There should be a goodly proportion of rooms providing shower facilities. Considerable importance should be given to the ventilation and heating of the bathroom, especially where the bath is inside. Air changes of from two to five minutes are necessary. Warmer climates and seaboard hostelries need greater ventilation.

Room Facilities. A frequent fault of the higher type of hotel is inadequate closet space. This should certainly be provided. The tourist business and growing convention traffic demand maximum flexibility and utility. Communication between rooms to provide accommodations for complete families and groups of guests is becoming more essential. The accompanying sketches will show several means by which this may be accomplished. All rooms today should have full-length mirrors in the door panels of the closets. The arrangement shown has proved very practical. Running or circulating ice water is now a necessity and not a luxury. Every guest expects it and resents the tipping nuisance of bell boy ice water service. Medicine cabinets are to be found in every good bathroom, which is also provided with towel racks, hot water bottle hooks, towel hooks, bottle openers, integral electric lights, and convenience outlets. The traveler today is bent on an elaborate toilet before the day's work or journey or before retiring. Several modern houses catering to tourists and women guests have seen fit to abandon the old ideas and are providing facilities for washing, drying and ironing lingerie, hosiery and gloves, handkerchiefs and small pieces.

Floor Service. Interior corridors need ventilation and are too often stuffy and poorly ventilated. All guest room floors should have adequate linen storage space, maids' closets, slop sinks, and general storage and fire protection equipment spaces. Where room service is a feature, there has been a tendency to waste space by having individual pantries. This is unnecessary, and all such service should be handled directly from the kitchen by service elevators and special service equipment.

Waste Space. Parlor suites and the de luxe AA rooms depend, in the design, upon the findings of the survey. The architect should always bear in mind the facts that rooms must be rented, and that every vacant room means a definite loss. There is too much tendency toward designing monumental structures with waste space and inflexible operation instead of common-sense, practical planning. And, too, the unfortunate architect is often controlled by the whims, ego and extravagance of an over-optimistic operator or owner who insists on having monumental evidence of his greatness while he ignores the weakness of his pocketbook and the relative loss in future income. The community-financed hotel also invariably becomes involved in financial difficulties, because the citizen committee insists on burdening the project with oversized dining rooms, lobbies and so-called "civic rooms," the latter being costly and used less than other spaces.

Maid Service. Referring again to guest room space, it is well for the designer to remember the "rule of eight." The average maid can handle



Typical Floor Plan of an Ideal 100-Room Hotel, 6 Floors and Pent House. Sixteen Rooms Can be Cared for by One Maid

16 or 17 rooms; 16, 32, 48, or the like rooms per floor, is ideal. On the other hand, 24, 40, or the like is satisfactory, as one additional maid can handle eight additional rooms per floor for two floors. Reference is made to the accompanying sketches for typical plans of a practical nature.

Sample Rooms. In commercial houses, sample rooms should be provided, but in de luxe houses there is strong opposition to this practice. In face, some de luxe operators will not tolerate them, while others with an eye to business, cover up their practice by referring to these rooms as "salons," "galleries," etc. Accompanying sketches show ideal arrangements for the average house.

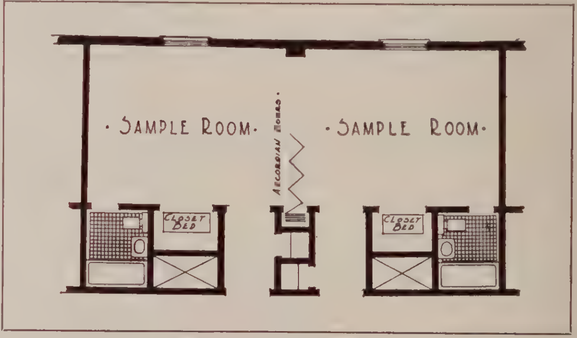
Public Space. Next to the guest rooms, the public space is most important, for if oversized it can, and frequently does, ruin the chances for profit. The entrance should always be designed so that it naturally invites the guest to enter the hotel. It should be a "one-man control" entrance, and double entrances are taboo. A double entrance should be provided only if the two connect before the stairway or entry to the business lobby is reached. Revolving doors or double vestibule doors should always be incorporated to prevent blasts of cold air from the outside. A hotel entrance is a busy place, and it can become a nuisance if not properly designed.

Old time hotels provided spacious lobbies, but that day is passing. The smaller business-like lobby reduces the number of "lounge lizards" and non-paying guests. In its stead a comfortable lounge adjacent to the lobby is coming into play, for it provides a more dignified atmosphere for the increasing number of women travelers and the better class of men guests. It affords the opportunity of providing a homelike atmosphere.

Women's lounges, smoking rooms, "powder puffs" or cosmetic rooms and toilets are now parts of the public area allotted to the women traveler. The toilets can be self-sustaining or even profit makers by using coin locks or arranging concessions to attendants. The men's wash room and toilet is an old time adjunct and affords an income to the house, usually through concessions, or in a smaller house by coin locks.

One of the newest features incorporated in an eastern de luxe house is a "meditation" room. Here is provided a beautiful small room, Gothic, in which any guest of the house can express his or her devotion to God, be his creed what it may, in silent meditation and in an appropriate atmosphere. Nurseries for the children of guests will be found in a few de luxe hostelries and have in general been profit-makers through a nominal fee or concession arrangement. Dog kennels have also been profitable in several urban houses, as there is a veterinary in charge, and a special cuisine for dogs is available at fashionable prices.

The dining room, coffee shop, banquet hall and other food-serving spaces present a difficult problem for the architect. It is the writer's opinion that no architect should take the responsibility of designating the space required for this business. Only an exhaustive survey can predict the food business and then only on a comparative basis with the conditions in the community and kindred communities well in mind. However, for the average house, there is a tendency to reduce the dining room space and increase the coffee shop area. This is indicative of the growing "grand American rush." One authoritative operator averages one seat in the dining room for every two guest rooms in the hotel and one seat in the coffee shop for every guest room in the house. The writer particularly warns the lay hotel architect not to definitely follow such a rule of thumb method. Put it up to the operator, and endeavor to get a survey made to secure the best results.



Sample Rooms Designed for Maximum Flexibility and Multi-use, 44-inch Doors to Admit Trunks

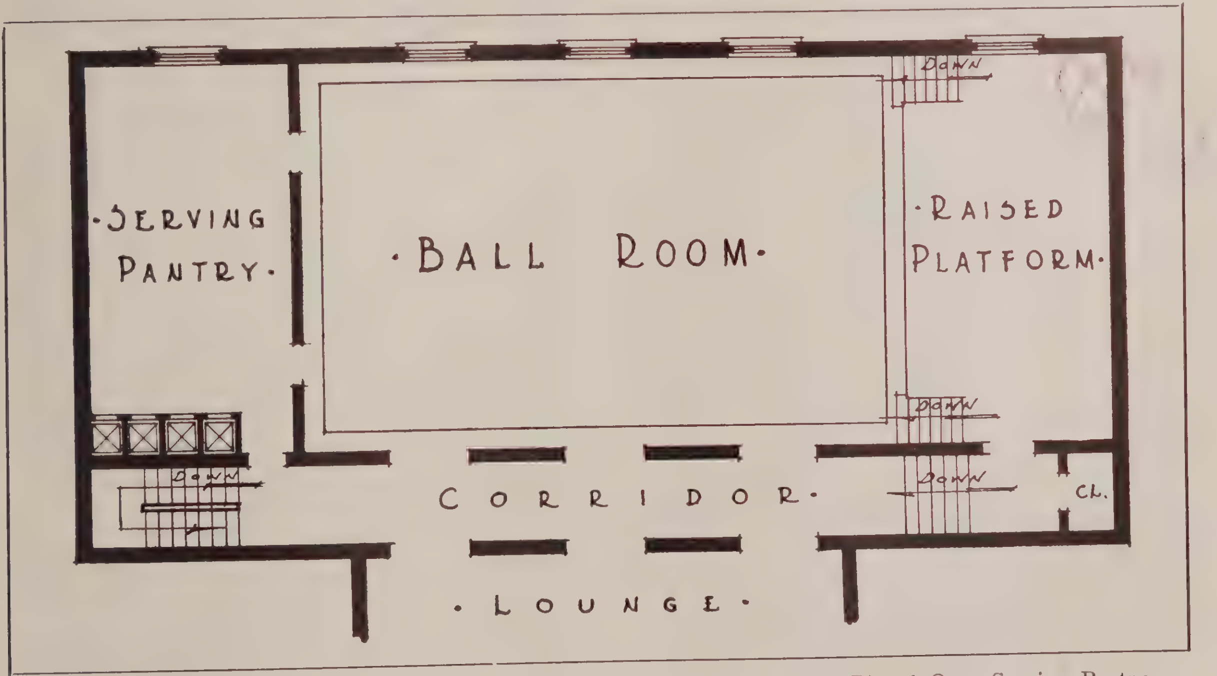
The banquet hall, ball room and civic room are usually one and the same. Local conditions alone can predict the size required. The writer recently recommended a combination room which is shown in the accompanying sketches. This room can be used as a dining room, banquet hall, ball room, auditorium, grill with dance floor, and for civic organization meetings and conventions. It is not intended as a compromise, but in the particular instance it meets the demands of a middle-sized city with varied hustling activities. Another sketch shows a satisfactory arrangement for a kitchen serving a dining room, ball room and a coffee shop below. In this case the ball room is used for many small affairs of high social caliber, and the coffee shop is of less importance.

Kitchen. Too much cannot be said about the kitchen, and volumes have been written about it. A real kitchen expert should always be consulted. Pantries often solve problems of food handling. Storage of food, too, is a broad and varied subject, too lengthy for discussion in this article. There is one thing for every architect to remember; whenever possible design your building so that food will travel in a horizontal plane, and reduce the vertical travel to minimum if you cannot eliminate it entirely. In keeping with the modern trend of discussing Prohibition, it may be in order to point out the resultant change in hotel planning since the elimination of the bar and cafe. In days gone by the bar made a huge profit and helped carry the land charges. Today these charges must be met in some other way.

Shops and Concessions. Several operators require that the design shall provide sufficient store or shop area to return at a fair rate of rental at least 10 per cent of the cost of the land, or in case of a leasehold enough to carry the lease and pay taxes and the like. In some instances this is impossible, wherein the operator must adjust his rates to meet the difference. In one case the writer succeeded, because of peculiar local conditions, in obtaining 20 per cent of the land value as the annual gross store rental. Other concessions such as valet, florist, barber shop, beauty parlor, telephones, telegraphs, porters, coat checking privileges and the like depend on conditions.

Stores and concessions should be made as flexible as possible to provide for facility in arranging the space to suit the tenants. A satisfactory solution in obtaining bids and letting contracts is to put in an allowance for partitions and the like and to adjust this as the work is completed. There should be coöperation between the renting agent and the architect.

The basement of a hotel is a factory and storage area. Here are housed all the mechanical equipment, such as the heating and power plant, fuel storage, laundry, incinerator, central vacuum cleaning system, refrigeration plant, steward's storage, air conditioning and ventilation apparatus, helps' locker rooms, helps' food space and kindred areas. Frequently space is provided for storage for the shops or stores. One eastern hotel has made a good profit with fur storage facilities in connection with a high class furrier shop.



Ball Room Planned for Multi-use. Projection Booth and Radio Control are Placed Over Serving Pantry
Microphone Pick-up and Accessories are at the Raised Platform

FEATURES THAT MAKE HOTELS PROFITABLE

BY

J. O. DAHL

HOTELS exist primarily for the sale of food and shelter. A building constructed for this purpose is seldom flexible enough to serve other commercial needs, and therefore the architect is faced with a situation that is unique. He must put into the structure that which will please the public at present and also 15 years hence. Obsolescence sets in early. Many hotels not over 10 years old are obsolete today because structurally they cannot be remodeled to meet modern demands. Within a mile of my office there is an example of beautiful hotel architecture that costs the operator $32,000 a year due to the loss of ground floor rentals. It is impossible to build in stores. Not a block away there is a successful hotel that runs its labor costs up $3,200 a year because the kitchens were not made large enough to give economical room service.

Next to planning a hotel that can be operated economically, is the necessity for building into it features that draw patronage. In a new hotel the advertising appropriation usually totals from 2 to 5 per cent of the first year's estimated gross revenue. It may, and often does, cost from a dollar to a dollar and a half to get each new patron. It is obvious, then, that the "repeat" guest is the patron who assures a profit. Therefore, the hotel needs features that have advertising value to bring in new guests and to so please its patrons that they will return frequently.

The list which is a part of this article is based on interviews and letters from hotel managers. For two years one of my stock questions has been, "If you were building a new hotel, what would it contain?" And in several hundred new modern hotels I have followed the success or failure of features listed. Many factors govern the value of the data. Transient hotels that sell rooms at $1 to $2 a day, would be over-equipped if each room had a full-length mirror, colored awnings, a room clock and a tailored closet. But another hotel a few blocks distant might succeed because of having such features.

Builders and promoters often display a strange lack of knowledge as to what kind of a hotel should be built. All too often a practical operator is not called in until the house is ready to open. It is under such circumstances that an architect must guard his future standing. The list shows the features advocated by managers of hotels. But it cannot, in a limited amount of space, show where and when they are advisable or essential.

An Efficient Tray Lift Speeds the Room Service

Well Equipped Closets with Convenient Mirrors

This can be determined only after a study of location, potential clientele, competition, price range, and service demands.

Structurally, managers do not look forward to many changes over those recently made. Soundproofing is essential to the future success of hotels that now furnish entertainment. The manager who can offer "noiseless hospitality" is assured of a high house count. If the "sun-tan" vogue continues, guests will pay extra for the privilege of having window glass that admits ultra-violet rays. Outside baths, casement windows and a sprinkler equipment are sales features of peculiar value to different types of hotels, but weather strips and central cleaning cut costs.

Hotel operators agree that the greatest advance in providing hospitality features will be along electrical lines. Television is around the corner. Radio in every room is here to stay; and the modern bathroom looks like a cross between a gymnasium and a hospital. But it is not at all unlikely that future hotels must provide facilities for exercises, violet-ray machines and other health equipment. "American life centers around the bathroom," said a famous French visitor upon his return to France. What he said in jest is rapidly becoming the truth. A beautiful bath with modern facilities for luxury and comfort is one of the best sales features. L. M. Boomer, president of the new Waldorf-Astoria Corporation, realizes this. The baths in the apartment suites of his new hotel will contain equipment found now only in the homes of unusually wealthy people. Women especially appreciate beautiful bathrooms, and they comprise at least 25 per cent of the patronage in American hotels.

Mechanical ventilation is today one of the best sales features in a modern hotel. In five years it will be impossible for a hotel to compete unless it has this equipment. This will also be true of temperature control, self-leveling elevators, and in apartment and residence hotels, incinerator equipment. The latter is modern and economical in operation.

Guests in the modern hotel expect speedy service. Therefore, it is essential to provide means for instant communication and transportation. Also they want doors that can be unlocked easily, rooms that can be found quickly unaided, parking space or a garage for their cars, overnight pressing service, one-day laundry service, bath tubs that fill and drain quickly, mixing faucets, good lighting, and the services of such departments or concessions as the barber shop, beauty parlor, soda fountain, drug store and library. Determining what they will want five years from now is the great problem of those who design and build hotels today. If such features are not found on the list it is because even the vivid imagination of many managers has failed to visualize a more modern and luxurious hotel than one including a composite of all the listed features and facilities.

COMPARATIVE VALUES OF CONSTRUCTION AND EQUIPMENT FEATURES THAT MAKE FOR A POPULAR AND PROFITABLE MODERN HOTEL

Key
E—Excellent.
G—Good.
X—Fair.
O—Of little value.

	Apartment Hotel	Residential Hotel	Club Hotel	Resort Hotel	Transient Hotel
I. Structural Features					
Soundproof construction	E	E	E	G	E
Central cleaning	E	E	E	X	E
Ultra-violet-ray glass	E	E	E	E	G
Outside baths	E	E	O	G	X
Weather strips	E	E	E	O-$_{1}$	E
Casement windows	E	E	E	E	E
Double connecting doors	O	O	O	E	E
Sprinkler system	O	O	O	E	O
Laundry chutes	E	E	E	O	E
Rubbish chutes	E	E	E	X	E
Beautiful entrance	E	E	E	X	E
Wood-burning fireplaces	E	E	E	E	O
II. Mechanical Features					
Temperature control	E	E	E	E	E
Self-leveling elevators	E	E	E	O	E
Incinerator	E	E	E	E	E
Circulating ice water	E	E	E	E	E
Mechanical ventilation	E	E	E	O	E
Air conditioning	E	E	E	O	E
Automatic door checks	E	E	E	X	E
Large drains in baths	E	E	E	E	E
Rustless hot water lines	E	E	E	E	E
Water softener	E	E	E	E	E-$_{19}$
III. Bathroom Features					
Silent flush toilets	E	E	E	E	E
Automatic shower mixers	E	E	E	E	E
Color in bathrooms	E	E	E	X	G
Mixing faucets	E	E	E	E	E
Built-in bathroom scales	E	E	E	E	X
Steel medicine cabinets	E	E	E	E	E
Enclosed showers	E	E	E	X	E
Tub and shower combination	E	E	E	E	E
Heated bathrooms (all year)	E	E	E	O	X
Hot water bag hooks	E	E	O	E	E
Bathroom clothes hooks	E	E	E	E	E
Built-in bottle openers	E	E	E	E	E
Chairs over toilet seats	X	X	O	O	O

Key

E—Excellent.
G—Good.
X—Fair.
O—Of little value.

IV. Communication Facilities

	Apartment Hotel	Residential Hotel	Club Hotel	Resort Hotel	Transient Hotel
Mail chute	E	E	E	O	E
Convenient telephone outlets	E	E	E	E	E
Servicing doors	E	E	E	X	E
Chauffeur signals	E	E	X	O	X
Public telephones	E	E	E	X	E
Intercommunicating system	E	E	X	X	E
Tubes, pneumatic	E	E	E	O	E
Teletype or telautograph	E	E	E	E	E

V. Room Equipment

	Apartment Hotel	Residential Hotel	Club Hotel	Resort Hotel	Transient Hotel
Friction door hinges	E	E	E	E	E
Modern door locks above knobs	E	E	E	E	E
Luminous door numbers	E	E	E	E	E
Radiator enclosures	E	E	E	E	E
Ventilated doors	E	E	E	E	E
Colored awnings	E	E	E	E	E
Rolled screens	E	E	E	E	E
Cedar closets	E	E	E	O	O
Full-length mirrors	E	E	E	E	E
Closet beds	E	E	E	O	O-$_6$
Wall safes	E	E	E	O	O
Built-in features	E	E	E	O	X
Room clocks	E	E	O	O	E
Door bolt switches	X	X	E	X	E
Tailored closets	E	E	E	E	X-$_{16}$
Carpet nailing strips	O	O	E	O	E
Drapery hardware	E	E	X	X	X-$_{18}$

VI. Special Rooms

	Apartment Hotel	Residential Hotel	Club Hotel	Resort Hotel	Transient Hotel
Club rooms	O	X	E	X	E
Convention halls	O	O	X	X	E
Gymnasium	E-$_3$	E-$_3$	E-$_3$	E-$_3$	E-$_3$
House laundry	E	E	X	X	E-$_7$
Barber shop	X	X	X	E	E-$_8$
Beauty parlor	E	E	X	E-$_8$	E-$_8$
First aid quarters	X	X	X	X	X-$_4$
Children's play room	E	E	O	E	E-$_{10}$
Rooms for guests' servants	E	E	O	E	O
Lockers for guests	E	E	E	O	E
Specialty shops	E	E	E	E	G
Private dining rooms	X	X	E	O	E
Banquet hall	O	O	E	O	E
Wrap checking rooms	X-$_9$	X-$_9$	E	O	E
Public dressing rooms	O	O	X	O	E-$_{14}$
Sample rooms	O	O	O	O	E
Public toilets	O	O	X	O	E-$_{15}$
Employes' locker rooms	E	E	E	E	E
Apartment suites	E	E	X	E	E-$_{17}$
Storage rooms	E	E	E	X	E
Paper baling room	E	E	X	X	E
Maids' floor closets	E	E	E	E	E

VII. Departments or Concessions

	Apartment Hotel	Residential Hotel	Club Hotel	Resort Hotel	Transient Hotel
Swimming pool	E-$_3$	E-$_3$	E-$_3$	E-$_3$	E-$_3$
Roof garden	E	E	E	O	E-$_9$
Safety deposit boxes	E	E	E	E	E
Garage	E	E	X	E	E
Valet department	E-$_{11}$	E-$_{11}$	E-$_{11}$	E-$_{11}$	E-$_{11}$
Soda fountain	X	X	E-$_{12}$	E-$_{12}$	E-$_{12}$
Quick service dining rooms	X	X	E	E	E
Ground floor stores	X	X	E	O	E
Professional offices	E	E	E	O	E

VIII. General Features

	Apartment Hotel	Residential Hotel	Club Hotel	Resort Hotel	Transient Hotel
Provision for pets	E	E	O	E	E
Parking space	E	E	X	E	E
Room service facilities	E	E	O-$_5$	X	E-$_{13}$
Provision for signs	X	X	X	X	E
Porte cochere	E	E	E	E	E

IX. Electrical Features

	Apartment Hotel	Residential Hotel	Club Hotel	Resort Hotel	Transient Hotel
Numerous electrical outlets	E	E	E	E	E
Radio outlets	E	E	E	E	E
Floodlights	O	O	O	O	E
Outlets for violet-ray machines	E	E	E	O	O
Shaving lights	E	E	E	E	E
Closet lights	E	E	E	E	E
Automatic refrigeration	E	E	E	E	E
Auxiliary lighting	E	E	E	E	E
Signal system (maids')	E	E	E	E	E

REFERENCE

1. Excellent for winter resorts.
2. Excellent for resorts that cater to family trade and for commercial hotels that also cater to residents.
3. Expense is seldom justified in a hotel of less than 500 rooms.
4. Almost essential to have space for this purpose in a hotel of over 500 rooms in size.
5. Excellent for clubs, such as the Union League, etc.
6. Very good for suites, sample rooms and parlors.
7. Sometimes profitable in hotels of under 100 rooms in size. Generally profitable in larger houses. In hotels of over 500 rooms, it usually pays to do guest work.
8. Depending on location. Hotels of 500 rooms or over can support a barber shop from guest patronage. In a 1,000-room house there are enough women patrons to make a beauty shop profitable.
9. Seldom profitable for catering facilities unless house is located in a large city.
10. Only for large hotels or smaller houses with a great deal of family business.
11. In hotels of under 200 rooms in size when handled in connection with the linen room. As a separate department when in hotels of over 200 rooms in size.
12. Only in hotels of over 200 rooms in size unless a street location is possible and the traffic heavy.
13. For hotels of over 200 rooms in size.
14. An excellent feature in large cities where many commuters stay downtown for dinners, theater, etc.
15. Provide for pay locks, disinfecting equipment, soap dispensers, shoe shine department, lavatories, mirrors, first class ventilation.
16. Special drawers and containers for men's and women's clothing.
17. Growing demand for these in metropolitan transient hotels.
18. Built-in features prevent breakage due to guests' carelessness in putting up own hangers.
19. If water tests show need for it.

MODERNIZING EXISTING HOTELS

BY

C. STANLEY TAYLOR

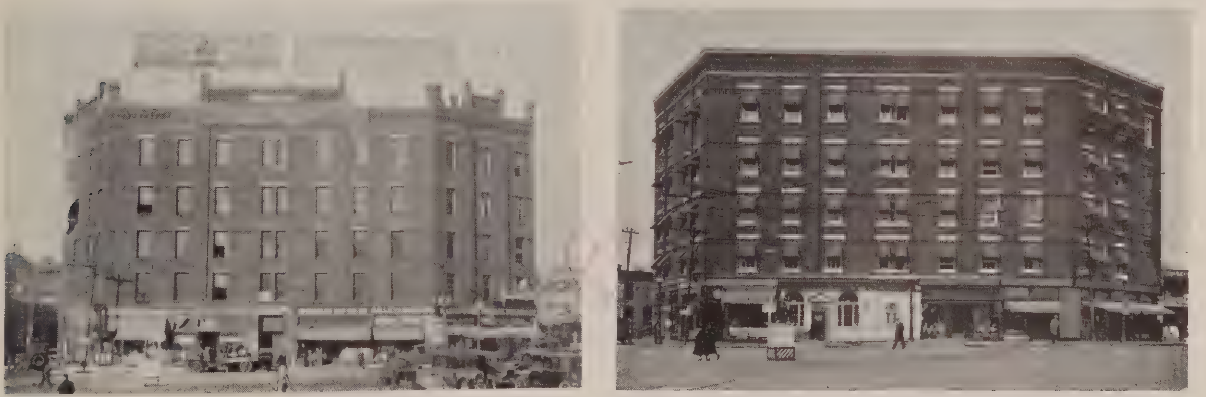
THERE has always been competition between new and old hotels, but until less than a decade ago, this competition seemed to take care of itself, while the attention of the hotel world was centered on a tremendous expansion of hotel facilities that has resulted in the overproduction of room space in many centers. It is hardly necessary to look into the causes which fostered the active promotion of hotels; undoubtedly the development of community-financed hotels has been a potent factor, but it does not stand alone as the only cause of recent hotel construction activity. Today the situation has so far developed that owners and managers of existing hotels must very seriously consider methods of meeting the competition of modern commercial and residential hotels in order to keep red ink figures from their balance sheets.

Fortunately, the modernization of existing hotels is frequently both practical and profitable. It is a type of work in which architectural counsel is just as important as in the creation of new residential structures. This field of hotel design offers a potentially enormous practice for those architects who are prepared to study the problems involved and to apply all of the ingenuity and skill at their command to achieve successful results with structures that have fallen behind the times.

Economics of Modernization. The owner of an existing hotel that is 10, 15, or even 50 years old has almost as many advantages as handicaps in competition for profitable business. When a new hotel is constructed, the site usually costs the owner the full prevailing market price for high grade centrally located realty. In the larger cities, hotel sites command prices which are almost the equal of those paid for the development of the most important commercial buildings. In smaller communities, where hotels are usually situated within a block or two of the center and yet outside of the center of maximum realty values, the purchase of a site does not often represent such a large part of the total investment, although it must always be considered an important factor. The owner of an existing hotel frequently possesses a site that cost him far less than its present worth,—and that is naturally far less than the investment which a new competing hotel would have to make for a plot of equal desirability.

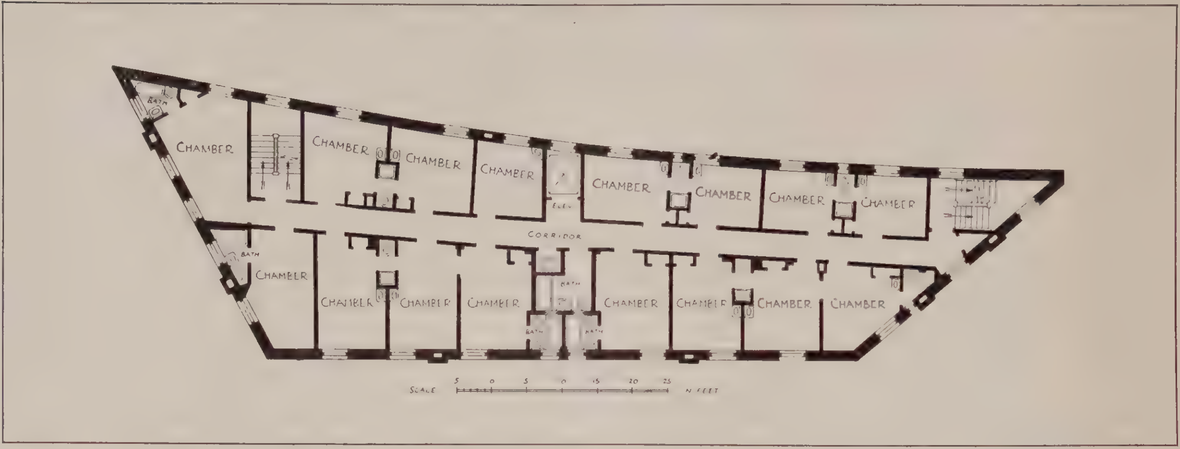
The construction of a new hotel also involves paying present-day prices for labor and materials which would be approximately double the prices paid for pre-war construction. Furthermore, the existing hotel has been writing off part of its valuation through reserves for depreciation and obsolescence. Thus when the old hotel starts out to compete again with its newer neighbors, it has the advantage of representing a far smaller capital investment upon which it must return dividends. The amount of remodeling and modernization work that must be undertaken to restore the old hotel to popular favor varies, of course, with the condition of the structure and the nature of the competition which it must meet. Nevertheless, it is usually possible to avoid expensive structural changes and to make extensive use of existing features so that the new investment required to catch up with the times is less than the investment necessary in a new hotel to provide the same facilities.

It should be remembered, too, that the old hotel does not need to command the same class of trade as a costly new structure, nor does it have to charge the same scale of prices in order to make a satisfactory profit. The investment is less; the



A Commercial Building Modernized into a Hotel at Worcester, Mass.

Leland Hubbell Lyon, Architect



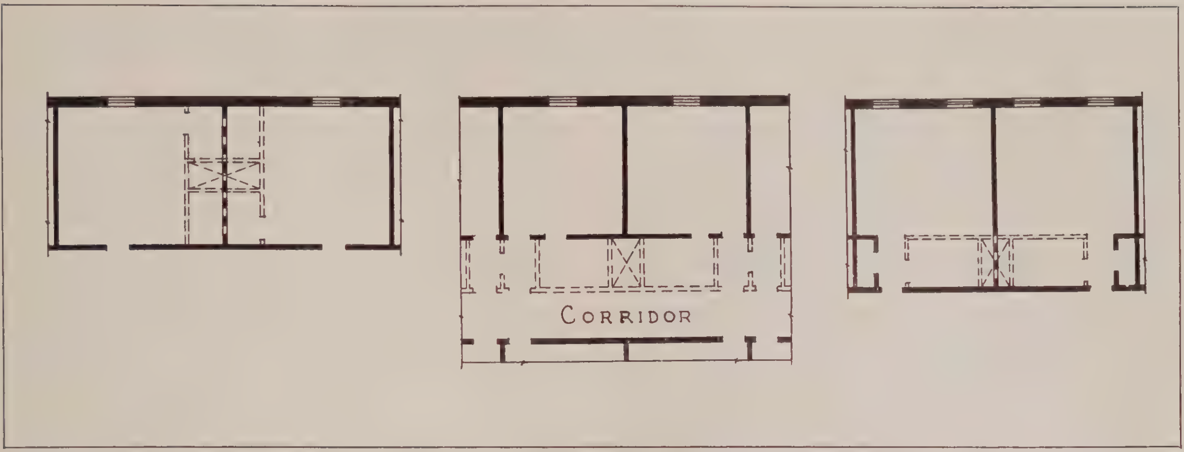
Plan of Worcester Hotel Shown on Preceding Page
Leland Hubbell Lyon, Architect

cost of the modernization is less than the cost of new construction; and the cost of financing a remodeling operation is usually very much less than the cost of raising funds for a new building. Operating costs are about the same per room in either a new or a modernized old hotel, but with overhead and fixed charges so very much lower, the gross income from room returns and concessions need not be very high in order to show a profit of satisfactory size.

The financing of remodeling operations is not as difficult as might appear on first thought. Paradoxically, some hotels that are almost hopelessly in debt to mortgagors and creditors can be refinanced more easily than a hotel that is just beginning to show losses. In such cases, the creditors, realizing that a failure of the hotel would return them little or nothing for every dollar owed them, and appreciating that once the hotel were modernized it stood a fair chance of recovering its earning power, are often willing to provide additional capital for a well planned modernizing operation in order to protect the money which is already tied up. If a hotel does not appear so hopelessly set, it nevertheless can present to bankers and often to individual investors such a clear analysis of the increased earning power of the hotel after it has been modernized as to secure the necessary financial support to undertake the changes.

Reasons for Remodeling. Remodeling and modernization should not be left until the hotel has declined to the point where its earning power has vanished. The intelligent hotel manager in recent years has realized the importance of making changes from time to time to keep in step with newer competition. The hotel that has been successful for many years is generally in greater danger of becoming obsolete than one that has had to fight for its existence. There is need for overcoming the inertia of success. The Waldorf-Astoria in New York is perhaps the most famous example, for this old timer retained much of its mid-Victorian character through more than three decades of competition from newer hostelries. To be sure, it constantly renewed its mechanical

Stores and Entrance of Aurora Hotel, Worcester, Mass., Before Modernizing



Plans Showing Three Methods of Providing Baths Under Various Conditions in Old Hotels

equipment, put in modern plumbing and lighting systems and up-to-date elevators, but finally the day came when changing conditions forced its demolition.

Successful hotels of this kind often develop a clientele of regular patrons who year after year reside in the hotel as permanent guests, or come back with such frequent regularity, because of their love for the old place, that the manager finds no need for cultivating new friends. Such a condition is interestingly illustrated by a small hotel of less than 200 rooms at Worcester, Mass. The old Aurora Hotel has enjoyed a patronage of well-to-do people who have lived within its walls, permanently or intermittently, for many years. Recently the manager began to note that some of his old patrons were dying off. The hotel still houses several octogenarians and one who is approaching the century mark. The younger people of the city rarely came to his hotel, because it had acquired a name for sedateness and old fashioned characteristics that offered them no attractions. What would happen when more of his old customers passed away? It was time to plan constructively for building up a new and younger clientele. The result of these thoughts was to engage an architect to completely remodel the lower floors of the building without unnecessarily disturbing the rooms on the upper floors favored by the present clientele. A handsomely decorated lobby, modern dining rooms and food service facilities, a coffee shop and space for profitable concessions were introduced in the ground floor and a modern ballroom where the younger generation could dance, and where local organizations and civic societies could hold meetings in attractive environment was created in the basement. The exterior was but little changed except that the entrance was made more attractive through skillful design. As the upper floors were temporarily vacated, they were completely redecorated and refurnished and the mechanical equipment brought up to date. Through this process of conversion the manager has wisely paved the way for attracting new patronage to replace the old that is literally dying out.

Stores and Entrance of Aurora Hotel, in Process of Modernization
Leland Hubbell Lyon, Architect

Addition to Hotel Not Originally Designed for Additions. Property Acquired Later. Penn Harris Hotel, Harrisburg

W. L. Stoddart, Architect

Types of Modernization Work. While the function of all modernization work is to increase net incomes, the manner in which this may be accomplished varies in almost every operation. It is governed by conditions and by the nature of the competition which the old hotel is facing.

Sub-rentals. So many old time hotels have enormous lobbies and extensive dining rooms, lounges and other public space far beyond the needs of its guests that one of the most common methods of increasing net income is the conversion of non-productive space into income-producing space through the introduction of stores, shops, and various types of concessions. The familiar small town hotel, with its plate glass windows, brass rails and overstuffed leather lounge chairs occupying valuable street frontage, is adopting the modern city hotel practice of putting the lobby into the back part of the building, or on the second floor and using its street frontage for small stores and shops. These old hotels were likely to employ excessively high ceilings for their public rooms. Sometimes there is sufficient room to introduce a complete additional floor by cutting in half horizontally the space formerly devoted to public rooms. Within these lobbies there is frequent opportunity for introducing news and tobacco stands, florist shops, barber and beauty shops, telegraph and telephone offices, and even brokerage and real estate office space with a minimum of structural alterations. Ball rooms and private dining rooms that do not command sufficient patronage to warrant their retention for their original purposes, may often be subdivided into guest rooms or sample rooms, or even sub-let for commercial office space. This method of introducing sub-rentals is the first problem of the architect to consider, because the returns secured are immediate and investment required is comparatively small.

Restoring Prestige. Another type of modernization work is largely centered around architectural and decorative improvements to public space and guest rooms that have merely become obsolete in style. New guests are very sensitive to the first impressions which they receive of any hotel. Remodeling the exterior facades, rearranging and redecorating lobbies and public space, and refinishing guest rooms in the style adopted by newer hotels will often give to the old structure an air of progressiveness and quality which are first aids in restoring it to favor and prestige with the traveling as well as the local public.

Modernizing Guest Rooms. Undoubtedly the most important changes, from the guest's point of view, are those which are made in the guest rooms. Modern hotel practice has established some well defined standards of accommodation. A comparison of these standards to the facilities offered in the existing hotel will quickly enable the architect and the hotel manager to discern the nature of the changes which must take place. Guest bathrooms are judged even more critically than are the guest rooms themselves, for perhaps the greatest improvements in hotel accommodations have taken place in these units during the last decade or two. Old fashioned hotel guest rooms are usually much larger than those offered by modern structures. The traveling public does not seem to resent seriously this cramping of temporary living quarters. In consequence, it is not usually a difficult matter to introduce bathrooms where they were lacking before by taking part of the space from each guest room, or by removing some of the partition walls between adjoining rooms and reconstructing three rooms where two existed before, or five rooms in place of four. Typical methods of introducing bathrooms are shown in the accompanying chart.

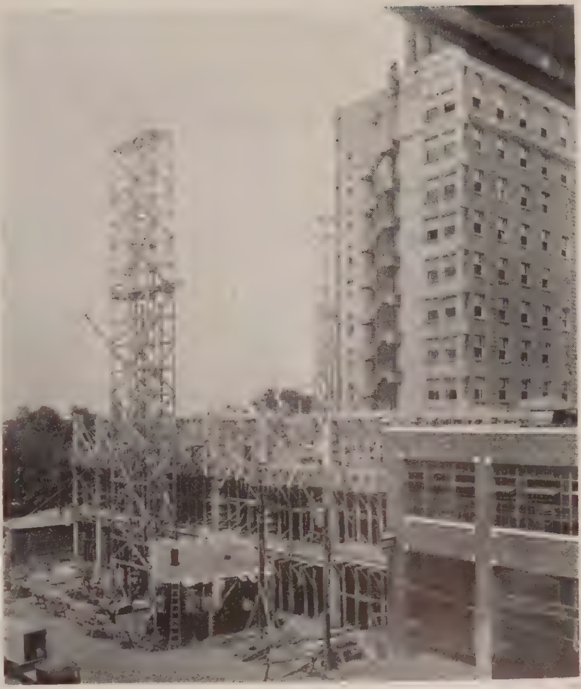
It is hardly necessary to describe in detail the physical changes to make or to re-create attractive guest rooms out of those so commonly found in old hotels. When changes are undertaken the aim is to secure accommodations which closely resemble the guest rooms found in modern hotels.

Modernizing Mechanical Equipment. One of the chief contrasts between old time hostelries and those of a very recent date is found in the character of the mechanical equipment, such as elevators, heating systems, lighting, plumbing, refrigerated drinking water, and telephone service. The modernization of heating plants opens up a number of very interesting opportunities. Old fashioned hot air systems that are sometimes still found in small tourist and resort hotels or inns, may often be brought up to date by installing new furnaces fired by coal, oil or gas with electric blowers to force air uniformly to all rooms. The addition of humidifying apparatus to this equipment and the introduction of check dampers to control the distribution of air as needed will often put the old heating system into very satisfactory condition,—even making it superior to steam or hot water installations that would be vastly more expensive. Old steam installations sometimes may be transformed to modern vapor vacuum systems, if the hidden distribution lines are sufficiently tight, by the installation of the proper types of valves, vacuum pumps and other elements, without any material change in the boiler or the piping layout. Much can often be done to improve heating service and reduce fuel costs by installing a modern boiler in place of one that is either worn out or of low efficiency. Ugly radiators may be covered with enclosures, or they may be replaced by modern types.

Old style elevators reveal their deficiencies very quickly to the sophisticated guest. Their replacement with modern equipment in the same shafts is frequently possible if the structure of the buildings will carry the load of modern elevators and if the shafts are in such condition that new guides and new doors may be installed without extensive alterations. Frequently elevator service may be increased to meet modern standards by such changes in equipment, or by taking a part of the waste space that is frequently found in old hotels devoted to broad staircases, remodeling or relocating the latter to provide for one or two additional elevator shafts.

The modernization of lighting systems can be accomplished at relatively low cost while other changes are taking place, by adding more outlets to switches, and installing convenience plugs and lighting fixtures. If the old system were run in rigid conduit, the necessary increase in capacity merely involves the replacement of light conductors with others of heavier size. New feeder lines may be run through elevator shafts or through vertical lines of closets from which extensions can be made by under-plaster construction.

Modernization of plumbing systems is not so easy of accomplishment, unless new bathrooms are installed in more or less vertical columns, one above the other on each floor. The structural changes necessary to provide additional baths and toilets are sufficiently drastic to permit the introduction of new soil and water lines. The replacement of old pipes feeding existing baths is more difficult, but the recent introduction of flexible copper tubing, especially adapted to remodeling work, will frequently make such changes possible at much lower costs than formerly. The improvement of telephone service and even the introduction of radio outlets in existing hotels is readily accomplished in much the same manner as the extension of lighting outlets.



Building Designed and Constructed for Future Addition. Robert E. Lee Hotel, Winston-Salem, N. C.
W. L. Stoddart, Architect

Modernizing Food Service Facilities. The food service division of a hotel deserves special attention not only because the guests react immediately to inadequate service or unattractive environment, but also because modern food service equipment has developed so far in recent years that its employment will often save labor costs in the preparation and serving of food. Kitchens, pantries, store rooms, refrigerators, dish washing equipment, and even the linen and tableware should be examined with a view to their replacement if necessary. Old fashioned dining rooms may usually be remodeled and redecorated at no great expense to compete successfully with the multitude of tea rooms, restaurants, cafeterias and coffee shops that have sprung up in the neighborhood since the old hotel was built. Store space that has not rented well, or waste basement area can frequently be converted into cafeterias and coffee shops, while excessively large public dining rooms may be reduced in size during the remodeling process, and the area converted to income-producing space.

CHECK LIST OF ITEMS TO BE CONSIDERED IN THE MODERNIZATION OF HOTELS

I. Preliminary Economic Studies

(a) Examine balance sheet and operating statements for last year or more to determine present investment and present return thereon; also examine monthly room occupancies over a period of years.

(b) Make careful survey of entire community to determine character of competition, potential business, proper rental scale after modernization, need for additional guest room space, demand for store concessions, etc.

(c) Consider value of present hotel site with reference to its continued desirability for hotel purposes. Would it be better to sell, or remodel for commercial purposes?

(d) Estimate the approximate investment that can be made in modernization work by comparing present gross income with estimated gross income based on result of preliminary survey. The difference capitalized at from 10 to 15 per cent will indicate the approximate additional investment that will be feasible.

II. Preliminary Architectural Studies

(a) Secure original working drawings, or prepare measured drawings of the present building.

(b) Obtain report of present structural condition of building to determine soundness and load-carrying capacity.

(c) If additions are to be considered, including additional bathrooms, examine into existing water supply, sewerage (or septic tanks) and pipe sizes to determine if they can absorb additional loads.

(d) Examine mechanical equipment to determine condition and feasibility of use as a foundation for improvements.

(e) Study exterior with regard to feasibility of remodeling to improve style or appearance. Also study interior architectural and decorative treatment of public areas and guest rooms.

(f) Prepare preliminary sketch elevations and plans incorporating changes suggested by preliminary economic survey.

III. Development of Preliminary Studies

(a) With the preliminary architectural studies check over the existing building in great detail, paying attention to these points where they are affected by the proposed changes.

  (1) Structural alterations necessary to incorporate changes.

  (2) Changes in mechanical equipment required by modernization program.

  (3) Examine condition of existing walls, floors, woodwork, doors and windows throughout building to determine what replacements will be necessary, or whether redecorating and refinishing will be adequate where no structural alterations are involved.

  (4) Examine lighting fixtures, hardware, electric outlets and other equipment features to determine finally what may be retained and what must be replaced as part of the program.

(b) Revise preliminary plans and elevations as may be required after this survey.

(c) Prepare outline specifications of changes and secure estimate costs of work involved.

IV. Development of Costs Studies

(a) Prepare a theoretical balance sheet for comparison, item by item, with existing balance sheet and operating statement to show: investment upon completion; gross income from rentals and concessions; fixed charges, and operating charges. Determine probable net income from operation as compared to present income or deficit.

(b) If net profits developed in this study prove inadequate, prepare revised architectural studies showing either a greater or lesser operation.

  (1) Consider feasibility of making less drastic changes by eliminating the items that are most expensive and that will increase revenue the least.

  (2) Consider more drastic changes, including additional rooms or the introduction of more sub-rental space without proportionately increasing the development of non-productive area.

(c) When both economic and architectural studies indicate a logical solution of the problem, prepare final studies and financial statement for presentation to bankers.

V. Final Drawings and Specifications

(a) Proceed with preparation of working drawings, specifications and details in the usual manner, except that if the hotel is to be continued in operation while changes are made, the work must be so organized and scheduled as not to interfere with the convenience of guests.

(b) Select finishes and decorations as required to complete modernization program.

HOTEL FRONT OFFICE EQUIPMENT

BY

W. P. DE SAUSSURE, JR.

EQUIPMENT ENGINEER

PROBABLY no hotel has enjoyed a higher prestige for service through many years than the original Waldorf-Astoria, in New York. Since service rendered in the front office was to some extent responsible for the enviable standing of this house, one might naturally assume that application of the principles and system of the original Waldorf office would fully meet any related requirement. What this system was, is no secret. It consisted of the application of one principle,—that of giving personality. After the first ten years at one station, the room clerks and information clerks applied their personalities to giving a superlative service, in the success of which equipment and system were merely incidental. Their task was rendered easier because traffic in mail, telephone, intercourse, and turnover at that time was small compared to the proportions it has reached today.

Unfortunately, under present-day conditions, one year is a long time for a front office clerk to remain at the same station. Before the Waldorf finally closed, the front office was enlarged, changed and rebuilt many times in a never-completed effort to accomplish what could have been done economically only in the office of the architect when the building was planned. This is not unlike the front office history of many hotels, some of them of rather recent construction. The volume of traffic today in the front office of an active transient hotel located in a metropolitan center is greater in variety and number of items than that of any other business conducted in the same space. Personality at its best, however much it has done and is doing, is not equal today to coping with these modern conditions unaided by intelligent planning in which space is made available to meet the requirements of both traffic and an orderly arrangement of adequate equipment.

Functions. A clear mental picture of the functions of the front office, together with an approximate knowledge of the space these functions require in proportion to the size of the hotel, is necessary in order that the architect may include these details in his plans with assurance and success. There are three main functions in the front office, (1) Rooming; (2) Billing and Cashiers; (3) Information and Mail. Each of these functions requires front counter positions for transaction of business with patrons, these counter positions being so arranged that necessary equipment, concealed from the patron behind counter screens, is within sight and easy reach of the clerk. Some operators separate Information and Mail (General Delivery Mail) into two counter stations. Bill Clerks and Cashiers are separate stations, or one clerk assumes the duties of both, keeping and paying accounts ac-

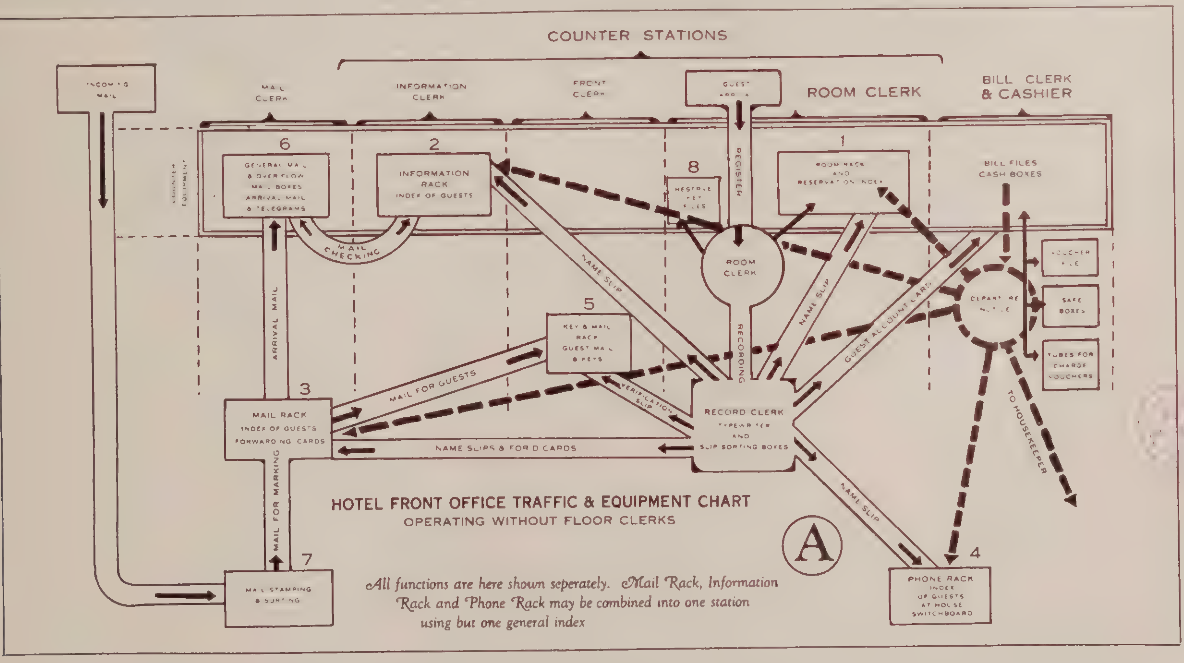
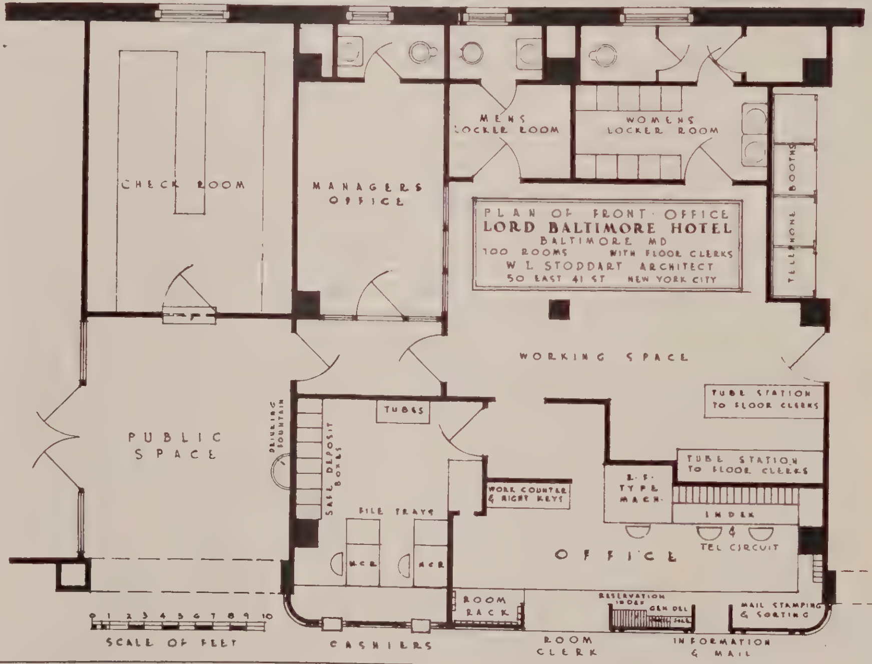

COUNTER STATIONS
INCOMING MAIL
MAIL CLERK
INFORMATION CLERK
FRONT CLERK
GUEST ARRIVING
ROOM CLERK
BILL CLERK & CASHIER
COUNTER EQUIPMENT
6
GENERAL MAIL & OVERFLOW MAIL BOXES ARRIVAL MAIL & TELEGRAMS
2
INFORMATION RACK INDEX OF GUESTS
8
RESERVE KEY FILES
REGISTER
1
ROOM RACK AND RESERVATION INDEX
BILL FILES CASH BOXES
MAIL CHECKING
ROOM CLERK
NAME SLIP
VOUCHER FILE
DEPARTURE NOTICE
SAFE BOXES
TUBES FOR CHARGE VOUCHERS
ARRIVAL MAIL
5
KEY & MAIL RACK GUEST MAIL & KEYS
RECORDING
NAME SLIP
GUEST ACCOUNT CARD
MAIL FOR GUESTS
VERIFICATION SLIP
3
MAIL RACK INDEX OF GUESTS FORWARDING CARDS
RECORD CLERK TYPEWRITER AND SLIP SORTING BOXES
NAME SLIPS & FORD CARDS
TO HOUSEKEEPER
MAIL FOR MARKING
HOTEL FRONT OFFICE TRAFFIC & EQUIPMENT CHART
OPERATING WITHOUT FLOOR CLERKS
NAME SLIP
A
7
4
MAIL STAMPING & SORTING
All functions are here shown seperately. Mail Rack, Information Rack and Phone Rack may be combined into one station using but one general index
PHONE RACK INDEX OF GUESTS AT HOUSE SWITCHBOARD

Chart Showing the Relations of Personnel and Equipment to Functions in a Hotel Operating Without Separate Floor Clerks cording to the operating plans of the management. In neither case is the space required for these functions materially affected.

Counters. A straight front counter 2 feet, 6 inches wide by 3 feet, 4 inches high, without counter stations or counter openings at side counters, which would expose unsightly details of the office to public view, is the preferred type. The Rooming function in the center, with Billing and Cashiers to one side and Information and Mail at the other side is the preferred arrangement. Each Bill Clerk or Cashier requires a minimum of 4 feet, 2 inches of counter with a small window 12 or 15 inches wide in the counter screen. One clerk, or 4 feet, 2 inches of counter space, for each 400 rooms will give the total minimum length of front counter required for this function of the front office. Counter width on the clerk's side of the screen should not be less than 15 inches. On the patron's side of the screen a counter projection of not less than 9 inches is sometimes desirable for convenience of the patron in writing checks.

For Rooming and Information and Mail, the preferred arrangement consists of an open counter of generous proportions with equipment and work space for the several stations behind counter screens. Hotels of up to 300 or 400 rooms would have the room selling board (Room Rack) behind the counter screen adjacent to the Cashier's partition. A screen of balanced proportions to the Room Rack screen is located at the other side of the open counter for the Information and Mail station and equipment. The key and letter rack for guest mail and keys faces the open counter. A counter station for a Front Clerk in the center of the open counter to pass out keys and mail is assumed to exist and is likely to be operated in busy periods. The preferred arrangement of the key and letter rack is one tier of pigeon-holes across the rack for the rooms of each floor of the hotel, or for each two floors when there are more than ten typical bedroom floors. The customary partition centers for these pigeonholes is 2 inches, and this multiplied by the number of rooms on a typical floor gives the length of the key and letter rack and a consequent basis for determining the length of the open counter, which should exceed the length of the rack by 3 or 4 feet. Add to the open counter from 4 to 8 feet for the two counter screens according to the size of the hotel, and we have the total counter length required. Hotels of more than 500 rooms might require an additional 2 feet, 6 inches of counter opening between the Room Rack screen and Cashier, for another Room Clerk, and a similar space at the other end of the counter for a General Delivery Mail Window and station. The width of counter on the Clerk's side of the counter screen should be 2 feet. The open counter facing the key and letter rack should not be of less than 6 feet, even in a very small hotel, and from 8 to 15 feet or more is required in larger hotels in proportion.

It is obvious from consideration of these requirements that having structural columns in the



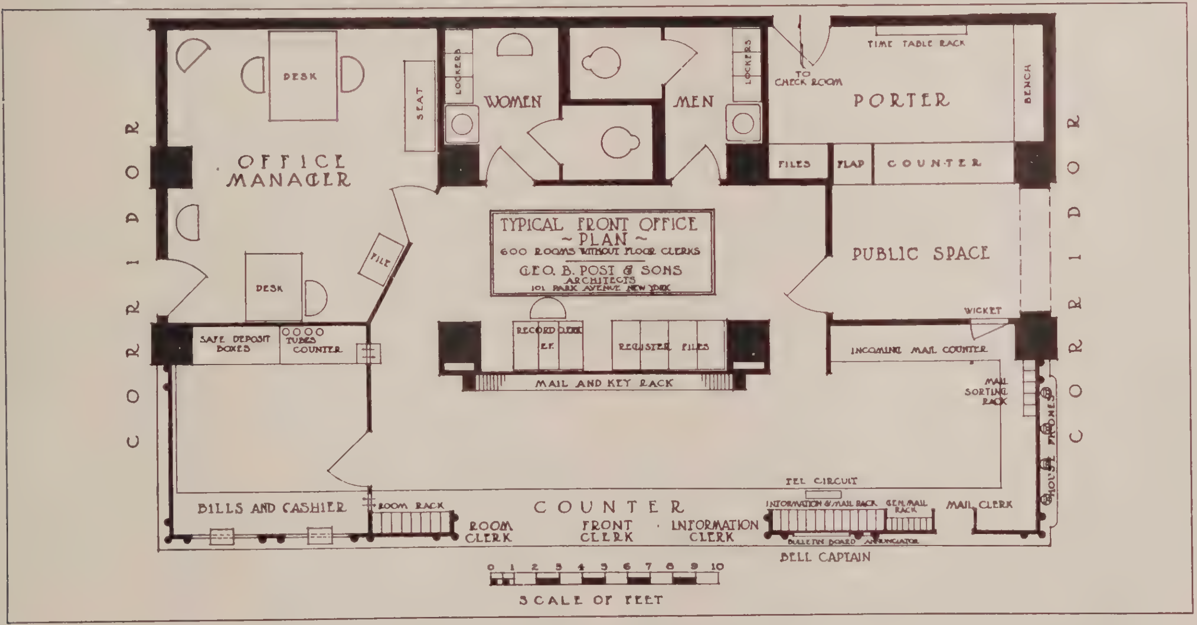
Plan of the Front Office of the Lord Baltimore Hotel, Baltimore

W. L. Stoddart, Architect

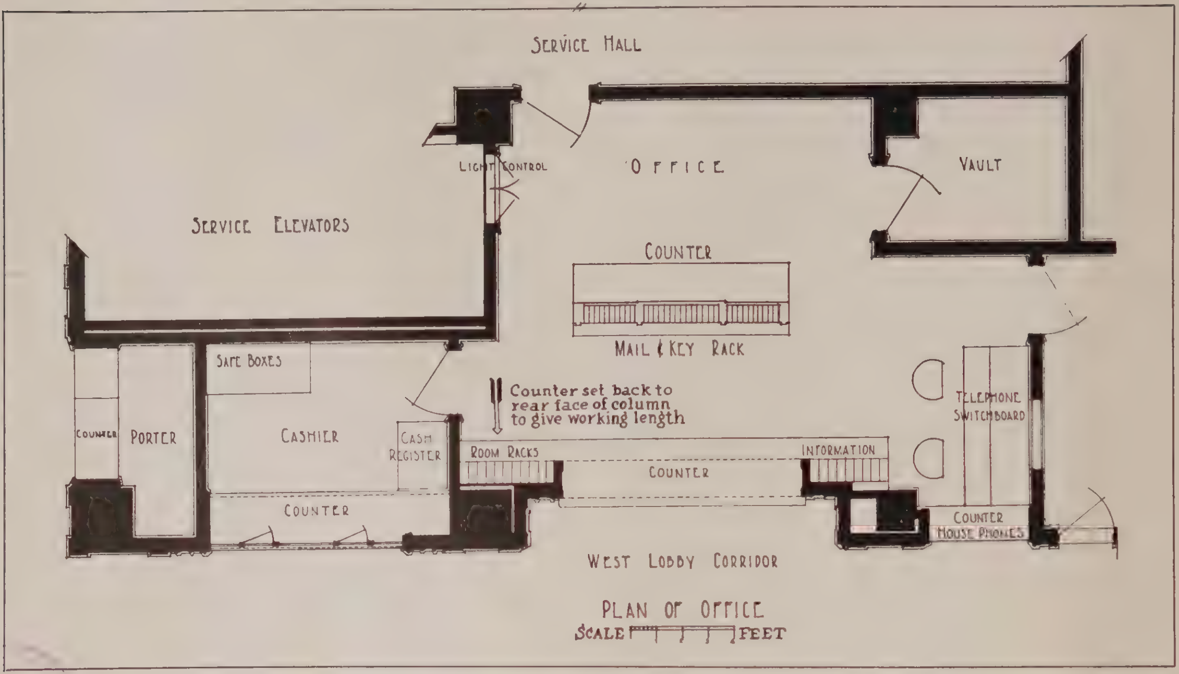
front counter line, unless they are happily located and room is available to make up the lost counter space, should be avoided. Safe boxes 2 feet deep are customarily located behind the Bill Clerks or Cashiers. A minimum distance of 6 feet clear is required between the face of the safe boxes and the front counter line. This total clearance of 8 feet from the front counter line to the rear partition can be maintained as a minimum distance throughout the length of the office if necessary. The customary distance from the front counter line to the face of the key and letter rack is 4 feet. In larger hotels a partition is extended on this line to conceal the working details of the back office. Openings in the partition should be without doors, and jogged or so arranged as to avoid presenting unsightly views from the front counter. Having additional length of office beyond the General Delivery Mail window for mail stamping and assorting to be done within reach of the front counter stations is the most economical arrangement of operating conditions for larger hotels. Additional depth of the office in excess of the 8-foot minimum is desirable in larger hotels to provide space for the office manager and for room reservation business.

Departments and Equipment. Other stations and equipment are required back of the front counter. In the Cashier's Department this includes pneumatic tubes for receiving restaurant, telephone and other charges, mechanical posting machines or bill files, and space for a voucher clerk with a work counter near the tubes. In the Rooming Department a typewriter and record clerk for typing and distributing registration records to the various departments is customarily located out of sight but within easy reach of the rooming counter. In the Information and Mail Department, special telephone information circuit equipment, and equipment for stamping and sorting mail are usually required. Electrical devices for timing items and for message recording may be required in all departments. In smaller hotels the telephone switchboard is usually located in the front office, preferably near the information index. When the size of the hotel requires a switchboard of more than two operating positions, it is generally best to assign a remote location where more space is available and suitable quiet and ventilation may be had. In placing the telephone switchboard it should be borne in mind that the back of the switchboard must be accessible for maintenance purposes. In the absence of specific information from telephone traffic engineers, the number of positions required may be figured on the basis of one for each 150 rooms. These and other details of screen dimensions and under-counter files will all be readily worked into final shape for a well appointed office if the factors and principles as outlined here are adhered to. The final plan is generally developed through advice from the operator and consultation with equipment specialists who supply the operating equipment. Much of this detail information is available in manuals published by manufacturers.

Floor Clerk Desks. Hotels which use Floor Clerks render key and mail service at the floor offices. The equipment of the Floor Clerk Desk in this case replaces the key and letter rack in

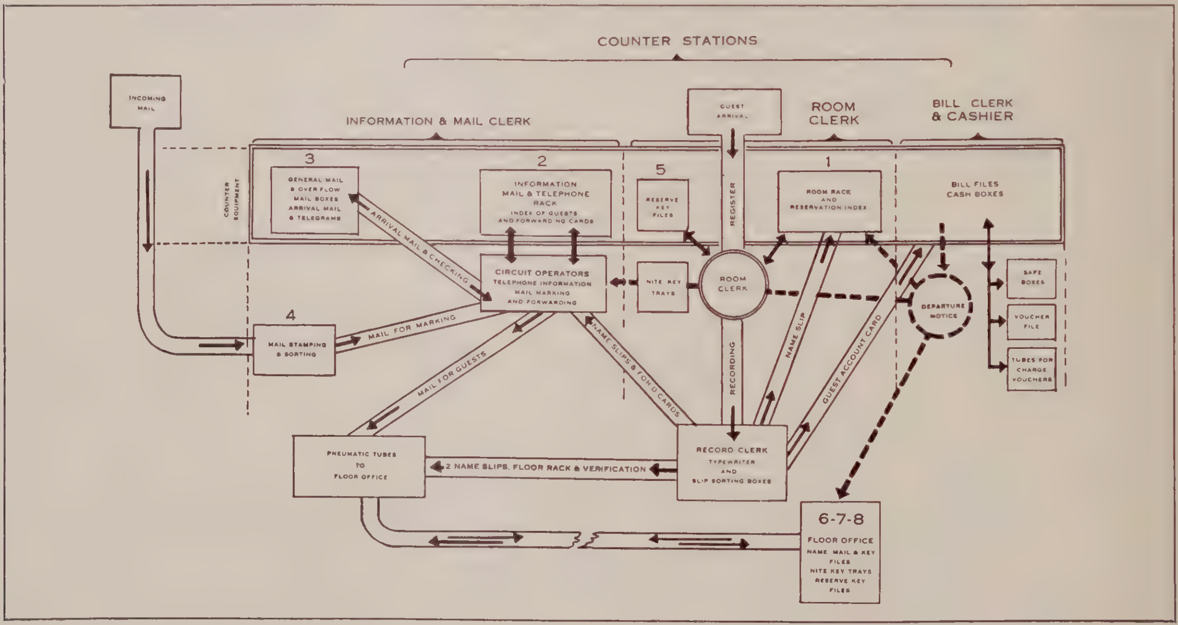


Front Office Plan for a 600-Room Hotel
George B. Post & Sons, Architects



Plan of Front Office, Read House, Chattanooga
Holabird & Roche, Architects

the front office. This eliminates the necessity for having a large open counter in the front office. The front office plan of the Lord Baltimore Hotel, illustrated herewith, may be considered typical of an office for this type of hotel. To fit this plan to a larger hotel of this type, add the required number of Cashiers and the Room Rack screen; increase the lengths of all counter screens, tube stations and index table; and provide one or more additional Information and Mail windows. The Read House front office plan illustrates how the front counter may be set back of columns to gain necessary space for equipment and work counter. Study of the typical front office plans and of the two charts of front office traffic will aid in acquiring the clear mental picture which will make the problem of planning the front office comparatively simple.


COUNTER STATIONS
INCOMING MAIL
INFORMATION & MAIL CLERK
GUEST ARRIVAL
ROOM CLERK
BILL CLERK & CASHIER
COUNTER EQUIPMENT
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GENERAL MAIL & OVER FLOW MAIL BOXES ARRIVAL MAIL & TELEGRAMS
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INFORMATION MAIL & TELEPHONE RACK INDEX OF GUESTS AND FORWARDING CARDS
5
RESERVE KEY FILES
REGISTER
1
ROOM RACK AND RESERVATION INDEX
BILL FILES CASH BOXES
ARRIVAL MAIL & CHECKING
CIRCUIT OPERATORS TELEPHONE INFORMATION MAIL MARKING AND FORWARDING
NITE KEY TRAYS
ROOM CLERK
DEPARTURE NOTICE
SAFE BOXES
VOUCHER FILE
TUBES FOR CHARGE VOUCHERS
4
MAIL STAMPING & SORTING
MAIL FOR MARKING
MAIL FOR GUESTS
NAME SLIPS & FOR'D CARDS
RECORDING
NAME SLIP
GUEST ACCOUNT CARD
PNEUMATIC TUBES TO FLOOR OFFICE
2 NAME SLIPS, FLOOR RACK & VERIFICATION
RECORD CLERK TYPEWRITER AND SLIP SORTING BOXES
6-7-8
FLOOR OFFICE NAME MAIL & KEY FILES NITE KEY TRAYS RESERVE KEY FILES

Chart Showing the Relations of Personnel and Equipment to Functions in a Hotel Operating With Floor Clerks

THE REDUCTION OF NOISE IN HOTELS

BY

CLIFFORD M. SWAN

THE first question that may come to the mind is whether noise really presents a serious problem in the modern hotel, except perhaps as far as the unavoidable sound of street traffic is concerned. A little reflection, however, will bring to the recollection of any traveler the loss of sleep he has suffered on account of an all-night poker game in an adjoining bedroom or because of a noisy elevator on the other side of the wall, or perhaps of the indigestion he has acquired through the nervous bolting of a meal in the hurried turmoil of the cafeteria or "coffee shoppe."

One assumes that a hotel is designed to cater to the comfort of its guests, and yet the chief factors in bringing this about,—namely, rest and quiet,—are often left entirely out of consideration. How much of this is due to false economy and how much to thoughtlessness or indifference, it is hard to say. At any rate, after some years of experience and scientific research, many of the difficulties arising from noise can be foreseen and their effects eliminated or minimized by suitable provisions in the design and specifications of the building and its furnishings. Ignorance is therefore no excuse, and the wise architect will devote a considerable measure of thought to such problems. In most cases, the proper provision for noise reduction must be made before or during the erection of the building. When it is completed, there remains little hope of correcting structural sources of trouble.

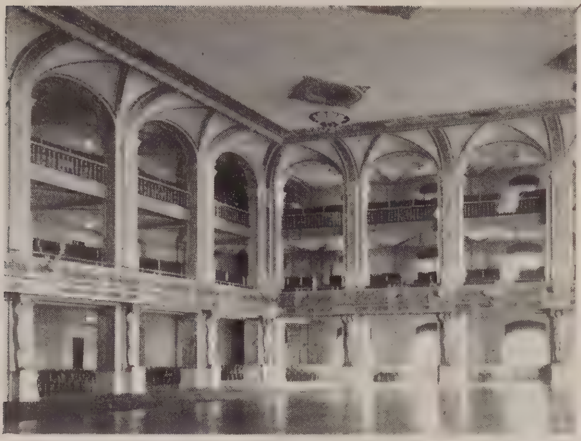
The Two Problems. There are two classes of problems to be considered. One is the reverberant condition which exists in many rooms and causes a magnification of any sound produced in them. The other is the transmission or conduction of sound from one part of the building to another. The first of these is susceptible of simple and positive solution according to known scientific laws; the second is more difficult, owing in part to complexities of structure and in part to lack of reliable data. Practical experience coupled with common sense is the chief guide in the latter case.

Reverberation, as every architect knows, is a condition existing in every enclosed room, no matter what its size or shape, when the interior surfaces of both the room and its furniture are composed of hard, sound-reflecting material. A sound generated in such a room can be heard for a number of seconds after the source has ceased, owing to the time required to absorb the energy in the course of many hundred reflections. Rapidly succeeding sounds therefore pile up on one another and by such accumulation produce a magnified and jumbled mass of noise. Conversely, if the sound waves can be so rapidly absorbed during a few reflections that their energy disappears in a short interval of time, the magnifying effect does not exist, and the room seems soft and quiet. This desirable condition is brought about by the use of absorbent furnishings or by finishing a suitable proportion of the exposed surfaces with a porous acoustical material.

There are many places in a hotel where reverberation is likely to cause trouble. Dining rooms are subject to considerable confusion from the sound of talking, the clatter of dishes and perhaps the noise of a jazz orchestra. A heavily lined carpet often helps to solve the difficulty, but this is generally restricted to the main dining room and to private dining rooms. Grill rooms and cafeterias with their hard floors should have absorptive treatment on the ceilings. The same applies to kitchens, dish washing rooms, serving rooms and pantries, especially those opening into public rooms or corridors. The acoustics of a large ball room must be adjusted with some care, since such a room is frequently used for concerts, amateur plays, and after-dinner speaking. Its shape, its size, its finish and its furniture all play important parts, and require the same attention as any other auditorium, such as a church or theater.

If there is a swimming pool in the hotel, it should have its entire ceiling treated, not only for the sake of those using it but also to minimize transmission of noise to other parts of the building. Corridors and bedrooms generally have thick carpets which reduce the reverberation which would otherwise exist. In telephone rooms or executive offices where considerable noise is produced, there should be ceiling treatment. The penthouses over elevator shafts should be lined on walls and ceilings with an absorber in order to muffle the sound of the machinery at its source. In general, it may be said that in all rooms where the furniture is scanty or not upholstered and where the floors are of an uncovered reflecting substance such as wood, concrete, terrazzo, marble or tile, the reverberation will be excessive and there should be absorbent treatment of the walls or ceilings or both. The extent of use of this material depends on the height and shape of the rooms, the amount and kind of furnishings, and the severity of the noise condition.

Reflection. Besides reverberation, which is occasioned by the diffuse reflection of sound, it is possible to have a certain amount of specular



Ceiling of Acoustical Plaster in a Large Ball Room

or mirror-like reflection. In such a case, echoes or distinct repetitions are produced. These may arise from parallel plane surfaces, but more often they are caused by a concave curved surface such as the vaulted ceiling of a ball room, grill room, swimming pool or lobby. To avoid such difficulty, the radii of curvature of all portions of such surfaces should always be considerably less than the height of the room or greater than twice the height. A surface with its center of curvature lying between these two extremes is sure to cause trouble.

Noise Transmission. We come now to the second part of our subject, the reduction of noise transmitted through the structure and partitions of the building. First of all, let us be sure that we understand the essential and great difference between this and the problems so far considered. Reverberation and echo are phenomena arising solely from the behavior of the waves of sound within any given room as they are reflected from the inside surfaces of that room, without any relation whatsoever to what happens in any other room separated from the first. Accurate calculation of the amount of reverberation can be made before a room is built, and provision can be made for the exact amount of absorption required to produce correct conditions, with definite assurance as to the results.

When we pass from the phenomena of reflected sound to those of transmitted sound, however, we enter an entirely different and more complicated field, handicapped by having inadequate scientific data and being forced to rely chiefly on practical experience. The methods used in the adjustment of reverberation have little relation to the new problem, except as they diminish the loudness of the originating sound. A new group of phenomena must be studied and a type of correction adopted in dealing with difficulties presented by this division of our subject.

Sound is produced by the mechanical vibration of a material substance within certain limits of frequency or oscillatory period. When such an oscillation takes place, whether it be in a musical instrument or the human larynx or a moving machine, part of the energy is communicated to the surrounding air and radiates in all directions in the form of air waves. The rest of the vibratory motion is transmitted to the supporting structure of the sounding body, whence it may travel as sound waves through contiguous solids.

The air waves travel until they reach an intercepting wall, floor or ceiling, and are partly reflected, partly absorbed and partly transmitted. It is that portion of these waves which is reflected which we have so far considered. We have now to examine the transmitted portion of the air waves, together with those waves that are conducted through the structural support of the sounding body.

Of course, the first thing to do is to diminish the intensity of the sound as far as possible at the source. Footfalls should be deadened by carpets or other resilient floor covering. All machinery should be adjusted mechanically to run as quietly as possible. Fans, generators and other rotating machines must be accurately balanced, noisy gears must be avoided, elevator guides and brake shoes must be quiet. The reduction of reverberation is an aid in reducing the source intensity of unavoidable sounds.

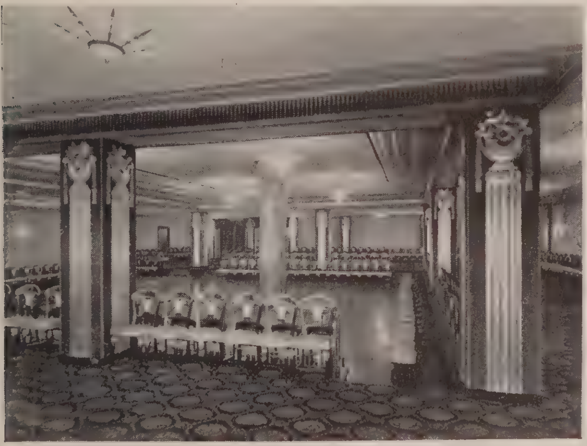
Conduction. Having done all that is possible to diminish the amount of sound created, let us next consider that portion which is communicated by direct conduction. This includes not only the vibration of machinery attached to floors or walls, but also to musical instruments such as a piano or violincello and to all noise of direct impact, such as walking or hammering. Obviously, some form of insulation must be used to prevent these sound waves from gaining access

Noise Reduced by Using Sound Absorbing Fiber Board for a Ceiling in the Pantlind Hotel, Grand Rapids to the structural fabric of the building. The nearer such insulation can be placed to the source, the better.

Machines should be bolted to their foundations through layers of cork or similar material. The foundation, which must be of sufficient weight to provide the proper inertia, should in turn be completely insulated from all direct contact with its surroundings by thick layers of cork or other resilient material. The necessary thickness and density of the insulating material are determined by the load carried. Various spring devices have also been successfully used in some cases to take up the vibrations. As far as is practicable, machinery should be located in the basement or subbasement to minimize the penetration of sound.

Ventilating ducts should be broken by canvas sleeves near the fan to prevent conduction along the walls of the ducts. Water, brine and steam pipes may require flexible connections at suitable points if proceeding from a noisy source. Soil pipes should be wrapped in sound-insulating material. Pianos should have their castors placed in sound-insulating cups. Resonating platforms required for instruments such as the violincello or double bass should be insulated from the floor. Chairs on a wood floor should have rubber tips on the legs. Employes should wear rubber heels. Necessity for taking these and other elementary precautions ought to be self-evident, but strangely enough they are often forgotten.

Too much emphasis cannot be laid on care in insulation, especially of machinery. Once a sound gets into the building structure, there is no telling how far-reaching and unexpected its effects may be. Concrete and steel are perhaps the best conductors of sound among building materials, owing to their homogeneity and continuity. Brick, on the other hand, is a comparatively poor conductor, especially if there is considerable difference of density between the bricks and the mortar.



The Ceiling of this Room in the Hotel Statler, Boston, is of Acoustical Plaster

Sound Absorbent Fiber Board Ceiling in the Shorecrest Hotel, Milwaukee

Air-borne Sounds. We come now to a consideration of air-borne sounds. These may travel directly through ventilating ducts, through cracks around doors, through corridors or elevator shafts, or even through open windows and thence by reflection from the walls of a light well or nearby building back through other windows. Or they may travel through the air in the room where they are generated until they reach walls, floor and ceiling, where they are partially transmitted into adjoining rooms.

Ventilating ducts are often a source of considerable difficulty. As far as noise from the fans is concerned, relief can be obtained by lining the interior walls of the duct with a suitable sound-absorbing material for a distance not less than four times the diameter of the duct. It is preferable to place this material near the fans and if possible around a bend in the duct. More serious trouble is experienced where there are several openings from one duct into different rooms. This should be given attention in the ventilating design, and nearby openings should be insulated from one another by absorbent duct lining. The worst trouble is generally in bathrooms all opening on one shaft. A bathroom is always very reverberant, owing to its hard enameled finish. This accentuates the sound of voices so that in combination with open ducts it is possible in many hotel bathrooms to hear conversations in a neighboring bathroom as distinctly as if they were in the same room.

A door crack or a keyhole allows a surprising amount of sound to pass. Bedroom doors, and especially those between rooms, should be carefully fitted, rabeted edges preferred, and with a snug threshold. The old-fashioned lock with its large keyhole, still sometimes to be seen in small hotels, should never be used. The modern double lock used in first class metropolitan hotels should always be specified. Corridors should always be heavily carpeted, not only to reduce the reverberation but also to prevent reflection which would make them act like speaking tubes. Elevator shafts must be as nearly soundproof as is possible.

Soundproof Partitions. Here we reach the most difficult problem of all—the construction of "soundproof" partitions—a field in which angels may well fear to tread. There is no doubt about the necessity of sound-resistant construction, not alone around elevator shafts but between bedrooms and other rooms, and sometimes even between floors. The question is how to provide a reasonably efficient partition which shall at the same time be not too thick nor prohibitive in price. These requirements are not consistent—hence one difficulty. Another obstacle is our limited knowledge from actual experimental data of the exact behavior of various materials and forms of construction when used in all their possible permutations and combinations. The third hurdle is the ease with which even the most carefully planned construction can be entirely ruined and set at naught by a single careless blunder on the part of some mechanic or his helper.

The factors governing the effectiveness of a surface of any given material as a barrier to sound are density, porosity, heterogeneity, thickness, stiffness and degree of damping. To produce a really efficient sound barrier, two or more materials are generally used in combination, with or without air spaces. Taking these facts in conjunction with various possible ways of erecting the materials, we see at once how complicated the problem really is and how much we need extensive unbiased research to reach a real solution.

In a hotel, the insulation of floors does not often have to be considered. Where it is necessary, the best solution seems to lie in a hung ceiling with an unbroken blanket of some good absorbent material in the space between the ceiling and the overlying floor slab. A floated floor is sometimes used above the slab, but in general it does not seem to be as effective, at least for air-borne waves, as the furred ceiling construction. The chief problem in hotels lies in the walls, especially between bedrooms. It is not the purpose of this article to recommend any definite form of construction for such purposes, but rather to indicate some of the lines of approach.

In general, a single wall plastered directly on both faces permits the passage of considerable sound. By alternating layers of widely different density in the construction, a great gain in efficiency can be produced. Thus a double wall, with an air space in which is placed an absorbent blanket, will show fairly good results with proper care in erection. The two walls must be absolutely independent, without any contacts which will serve as conductive channels. Braces between such walls may even act like the sound-post of a violin and accentuate rather than diminish the transmission. The disadvantage of the double wall is, of course, its thickness and cost.

Other types of walls with various combinations of hard and absorbent substances have been tried with varying degrees of success. The danger in such cases lies not so much in the failure of the combined layers to act as a direct barrier to the sound as in the tendency to reduce the thickness and total mass of the wall to such an extent that stiffness is sacrificed. The resultant flexibility causes vibration of the wall as a whole, and by this diaphragm action it allows impinging sound to be communicated to the air on the other side. With walls of large extent, some sort of an interior air space seems to be almost a necessity unless they are very massive and heavy.

Whatever type of construction is adopted, extreme care must be taken to supervise the actual work in order to be sure that the specifications are carried out to the letter. Double wall construction has been known to fail because workmen have dropped mortar and rubbish in the air space, thus making direct contact between the two walls. Electricians are likely to cut a hole entirely through the wall and place outlet boxes back to back in the aperture, so that to all intents and purposes there exists an open window between the rooms. The layout of electrical conduits, steam and water pipes and ventilating ducts must be studied with care that they shall not pierce the soundproofing.

Communicating doors between bedrooms are a serious weakness. An ordinary single paneled wood door is of about as much value as a sheet of paper. The rational solution is to use a double door, as is often done in the better hotels. Such doors should be flush and not paneled and should be as thick and heavy as practicable. There must be no cracks around them. Elevator and dumb-waiter shafts if improperly insulated are a source of great annoyance to guests in adjacent rooms. Particular attention should be given to them.

As has been pointed out, attention and common sense are the fundamental elements most necessary in providing for noise reduction in hotels or other buildings. With due exercise of these qualities, many problems can be foreseen and met, with much consequent saving of time, annoyance and expense. There is, to be sure, much yet to be learned about the behavior of sound in building structures, but sufficient is already known to make it possible to avert some of the dire results which are often encountered.

MODERN KITCHEN EQUIPMENT CONSTRUCTION

BY

VINCENT R. BLISS

TAYLOR, ROGERS & BLISS, CONSULTANTS

IF one were to compare 25 hotel kitchens as they were equipped 15 years ago with an equal number of the last few years' installations, it would be forcibly brought to light that the present-day standard of construction and materials is far superior. In part this is the result of the better structural methods used by the manufacturers, but to a greater degree it reflects a change in the attitude of hotel operators and their architects.

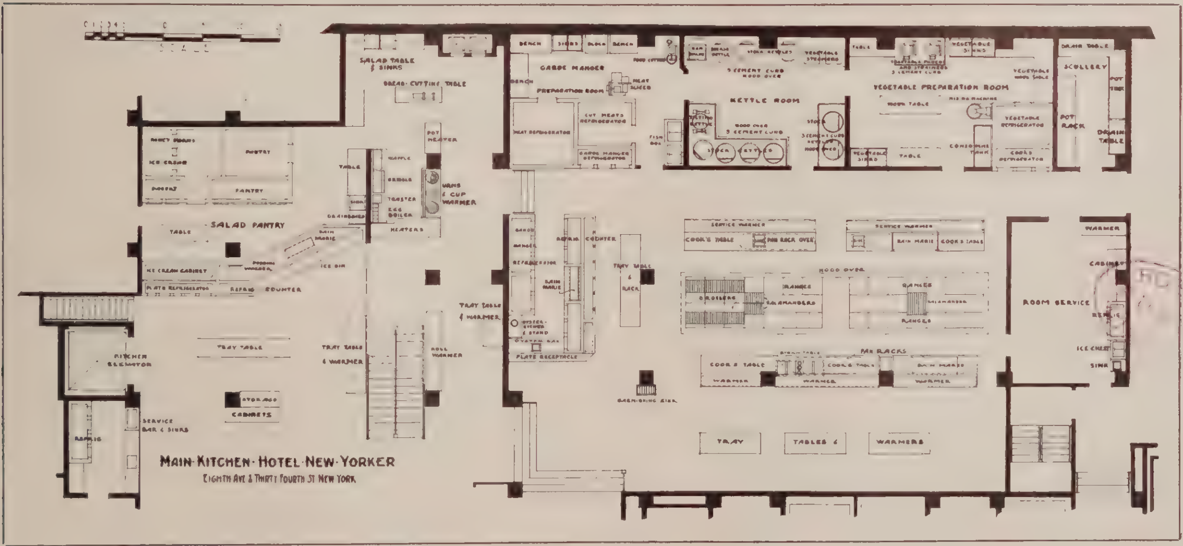
It has taken time to accomplish it, but hotel and restaurant men now seem to be thoroughly alive to the soundness of investing in equipment with an eye to more than initial price. With the liberal profits of the bar business no longer here to fall back upon, food service operation has come in for intensified business study, and the improved conception of the value of culinary apparatus is a natural result. More than this, standards of cleanliness and sanitation have entirely changed. It used to be common to hear some sophisticated person remark: "If you could see the kitchen that food came from, you wouldn't want to eat it." This sort of indictment is no longer justified. The newer types of equipment are just as far advanced in cleanliness and appearance as they are in durability.

Architects no doubt will claim a share of the credit for this improvement, and there is evidence to support this contention. The interest they display in the food service facilities of buildings of all types is noticeably more active, and their cooperation with the kitchen engineers is infinitely more understanding than was the case even ten years ago. While recognizing this improvement, however, it is well to be equally frank about the other side of the picture. These considerations, therefore, are recommended for serious thought:

1. Few architects or hotel operators have more than a superficial understanding of kitchen equipment construction.
2. There is a general lack of knowledge as to what features of construction are really essential to economy and practicality.
3. Much of the equipment that is now being used is distinctly behind the times and should be improved upon.
4. There is far too much specially designed and made-to-order equipment used in most kitchens.
5. A definite need exists for more standardization in equipment design.

Furthermore, so long as quality of equipment is imperfectly understood, the judgment used in the forming of specifications and awarding contracts is quite likely to be at fault. The obvious corrective is the intelligent use of the architect's power to guide and define specifications, but this can be made effective only through a study of equipment construction and a clear insight into the conditions of the industry.

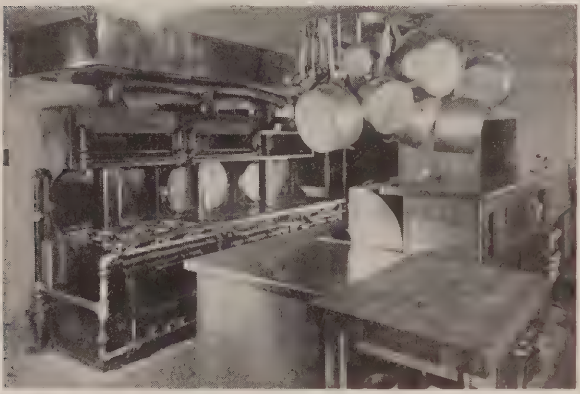
Determining Quality. In deciding upon the



Plan of Main Kitchen, Hotel New Yorker, New York

Sugarman & Berger, Architects

general quality of equipment to be specified for a kitchen, individual conditions are the first to be considered. For a restaurant operating in rented space, the length of the lease and the likelihood of its being renewed will be factors, for there is undoubtedly a definite relation between the length of occupancy and the rate of depreciation which should properly be charged against the equipment investment. For hotel structures, however, this is rarely a point of issue, for regardless of changes in ownership, it will logically be expected that a hotel building will be used for its original purpose for an indefinite number of years. Selection of quality for hotel equipment, therefore, should resolve itself into determining the materials and construction which will show the most favorable record with regard to depreciation, obsolescence, maintenance and operating costs over a long term of years.



Main Kitchen, Fountain Square Hotel, Cincinnati

Main Kitchen, New Jefferson Hotel, St. Louis

That the various grades of kitchen equipment differ greatly in their ability to stand up under service will not be questioned. It is interesting to observe in this connection that the generally accepted rate of charging off depreciation on kitchen apparatus is 10 per cent per year, and that while no doubt it was the object in naming this figure to be thoroughly conservative from a financing standpoint, it is probable that a ten-year life is not far from the performance actually experienced by many. Experienced operators, however, know that this ten-year life can and should be vastly improved upon.

The Choice of Materials. One of the first points to come up for consideration in preparing specifications is the choice of materials. Many years ago the better class equipment made use of a blue-black steel body with polished or nickel plated steel trim, and polished steel tops. Later, the use of porcelain-enameled steel for body panels became quite popular, but of recent years there has been a very strong trend in the direction of corrosion-resisting alloy metals. This type of metal has proved itself ideal for kitchen equipment purposes, for it not only has ample strength and durability but is practically unaffected by any corrosion, has no contaminating effect upon food, and retains its fine silvery appearance indefinitely, while lowering maintenance and cleaning costs. Its use in the manufacture of equipment is constantly widening, and in many of the recently built kitchens it is specified almost to the exclusion of other metals. The cost of alloy metal equipment is higher than that of any other type, but that it is economical has been proved.

There are, of course, hotels whose finances will not permit exclusive alloy metal construction, but even in the least expensive installations there are certain places where the use of any other material is extremely short-sighted. Just where to draw the line in this respect is often puzzling, but this might be taken as a fairly practical rule:

1. Corrosion-resisting alloy metal should be used for:
    - Steam table tops and accessories.
    - Urn stand tops.
    - Cafeteria counter tops.
    - Soda fountain workboards.
    - Ice cream cabinets and cooler tops.
2. Wherever possible alloy should be used for:
    - Pot and vegetable sinks.
    - Dish table tops.
    - Work table tops.
    - Warmer and serving fixture tops.
3. For ultimate economy and fine appearance, alloy metal should be used for:
    - Warmer and cabinet bodies and trim.
    - Range and boiler bodies.
    - Counter bodies and trim.
    - Hoods and canopies.
    - Refrigerator linings and facings.
    - Dishwasher bodies.

(*Continued on page* 748)

A COMPARISON OF EQUIPMENT CONSTRUCTION

These two diagrams have been made to show how greatly two pieces of kitchen equipment may differ in construction and quality while still being so nearly alike in appearance that they might easily be confused with each other. The examples shown here are identical in dimensions, general design and arrangement—yet an analysis of their construction reveals 15 important points on which Fig. 2 is definitely inferior to Fig. 1. These structural differences alone (without taking into consideration the probability of poorer workmanship and finish) are enough to cause a 25 per cent lower cost for Fig. 2, but this saving is more than offset by the shorter life and greater expense of upkeep that will be the result of its inferior construction. While this comparison was intentionally made somewhat extreme for purposes of demonstration, it is not unusual to encounter equally serious differences in actual competition, especially when the additional elements of workmanship and changes in design are taken into account. A study of these diagrams point by point will be of practical help in forming specifications. The word "metal" indicates non-corrosive alloy metal in these descriptions.

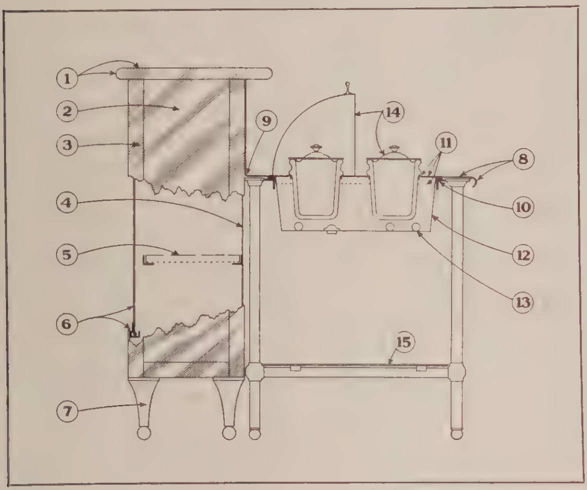


Fig. 1

Cook's Table, Steam Table and Warmer, High Grade Construction

1. Warmer top is No. 12 gauge metal with rolled edges, and welded corners rounded and finished smooth.
2. Warmer body panels are solid No. 20 gauge metal.
3. Angle corners and trim of warmer are of solid metal.
4. Rear side of warmer body of No. 20 gauge solid metal.
5. Shelves are No. 18 gauge metal, edges turned down on all four sides, edges neatly hemmed back to prevent sharpness, corners welded. Shelves perforated and removable in sections and rest upon angle frames riveted to body of warmer.
6. Warmer doors are of solid No. 18 gauge metal, with one-piece welded No. 12 gauge solid metal frames. Door handles chromium plated, roller bearings.
7. Warmer has cast white porcelain sanitary legs.
8. Cook's table top is No. 12 gauge metal with rolled edges and corners welded, rounded and smoothed.
9. Rear edge of cook's table top is turned up and extends up to underside of serving top of warmer, with 2-in. solid metal band trim.
10. Opening for steam table is reinforced underneath with No. 10 gauge 1½ in. metal angles on which the steam table rests so that top of steam table is perfectly flush with top of cook's table.
11. Steam table top of solid No. 14 gauge metal, braced beneath by metal "V" struts, insuring absolute rigidity. Openings in top have reinforced edges.
12. Water pan made of 30-oz. cold rolled copper tinned inside, securely seamed and soldered at all joints.
13. Brass steam coils.
14. Jar covers, meat pans and meat pan covers all made of metal; vitrified china jars.
15. Removable slatted band iron shelf, galvanized.

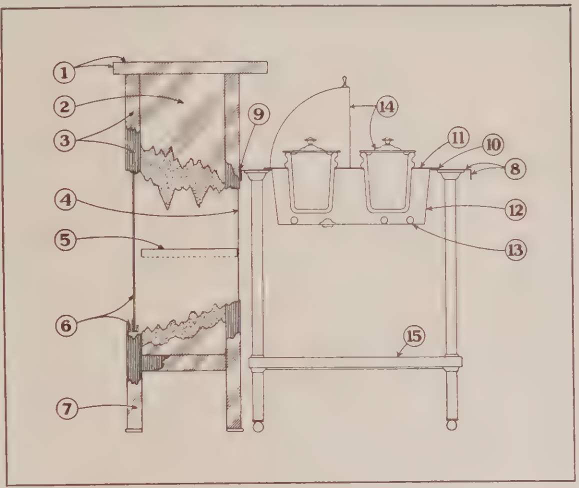
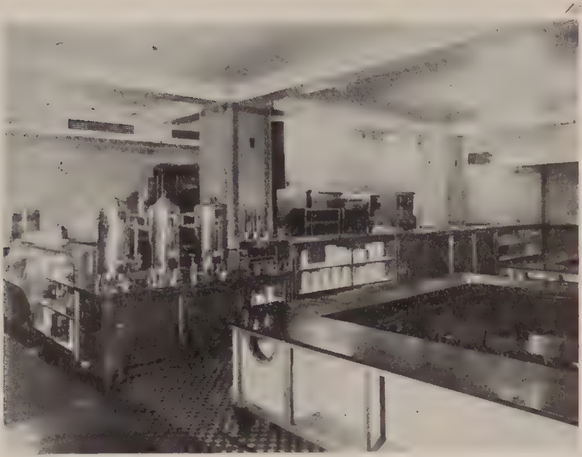


Fig. 2

Cook's Table, Steam Table and Warmer, Inferior Construction

1. Top is No. 14 metal with square edges and corners welded but not carefully finished.
2. Warmer body panels are thin (No. 25 gauge) metal over galvanized iron.
3. Angle corners and trim are of steel, wrapped (veneered) with thin gauge metal.
4. Rear side of warmer is of galvanized iron.
5. Shelves are No. 20 gauge galvanized iron, riveted to the warmer body. These shelves are not perforated, not removable, do not have welded corners and are unsupported by any angle framework.
6. Warmer doors are of No. 25 gauge metal over galvanized iron with wrought steel frames wrapped with thin gauge metal. Doors have nickel plated handles, and operate without roller bearings.
7. Angle corners of warmer body are extended to floor,
8. Top is No. 14 gauge metal with square edges and corners welded but not finished smooth.
9. Rear edge of cook's table is turned down, leaving the galvanized iron warmer back entirely exposed.
10. Opening for steam table is not reinforced; steam table is mounted on cook's table top, and therefore the two tops do not provide a flush surface.
11. Steam table top is made of No. 22 gauge metal stretched over galvanized iron. Bracing beneath top and reinforcement around openings are omitted.
12. Water pan made of 24-oz. copper, tinned inside but less carefully constructed.
13. Galvanized iron steam coils.
14. Nickel plated copper meat pan and jar covers and enamelware meat pan; stoneware jars.
15. Galvanized sheet steel shelf.

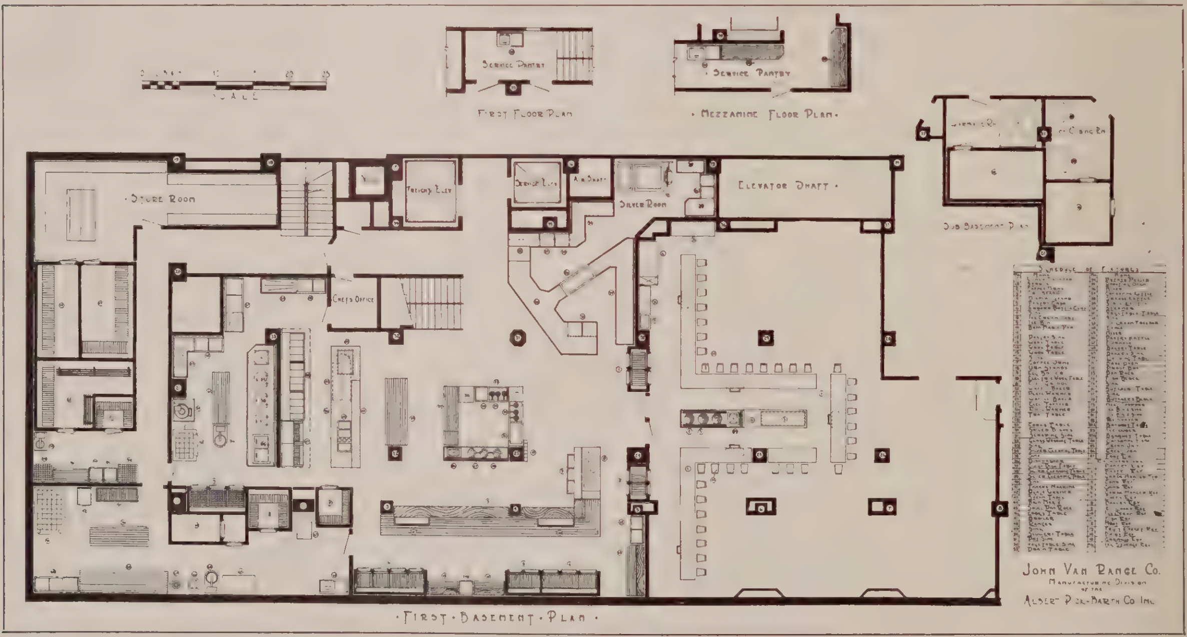


Coffee Shop Serving Kitchen, Lord Baltimore Hotel, Baltimore

Where the use of alloy metal is out of the question because of cost, the body construction of general service equipment may make use of porcelain-enameled steel, blue-black steel or galvanized iron. Porcelain-enameled steel does not offer much of a saving, and for this reason it is diminishing in popularity, except for counters and other fixtures to be used in the restaurant proper. Blue-black steel is lower in cost, but it must be given constant attention to prevent its becoming ruined by rust. Galvanized iron is, of course, the cheapest of all, and is likewise the least satisfactory from the standpoint of appearance and ease of cleaning,—disadvantages which are somewhat offset by keeping the equipment painted.

Differences in Methods of Construction. Settling upon the general design and materials to be used in the kitchen equipment unfortunately does not dispose of the question of quality, for the method of construction is equally important. Grades of quality are very loosely defined. No two manufacturers use exactly the same methods of construction, and indeed some concerns have two or more qualities upon which they will figure according to circumstances.

Without going into a multitude of details, it is a little difficult to give a clear idea of the structural variation that is possible on equipment of almost identical outward appearance. Individually, these differences may often seem small, but in the aggregate, they mean a great deal,—and it is this fact that accounts in most cases for the wide disparity between the high and low bids which frequently occurs. Your specifications will call for equipment as made by some manufacturer whom you have selected for his responsibility and engineering skill, with the qualification that consideration will be given to other manufacturers' products, which in your judgment are of equal merit. That is as it should be, but it is still a truth that the majority of the bids received may not be on the original quality specified at all. Even the most responsible manufacturers, no matter how sincerely they may try to conform, will show some difference on 90 per cent of the items other than specialties. But among the group of concerns called in, it is safe to say that there always will be at least one which will attempt to secure the business on the basis of low price alone, and which, in order to do so, will interpret the specifications just as much in



Plan of Main Kitchen, Lennox Hotel, St. Louis

Preston J. Bradshaw, Architect

favor of cheapened construction as it feels is safe. There is only one way to guard against this. The original specifications must be thorough, explicit and complete, and the discretion used under the "or equal" clause must be based upon an investigation of each firm's methods of construction, rather than on a general impression as to its responsibility.

A concrete illustration will help to make this more understandable. Let us take for an example a combination of cook's table, steam table and service plate warmer,—an item of equipment which is included in every hotel kitchen. Assume now that you have decided on what might be termed complete alloy metal construction, and that your specification reads in this way:

Cook's Table With Steam Table and Service Plate Warmer

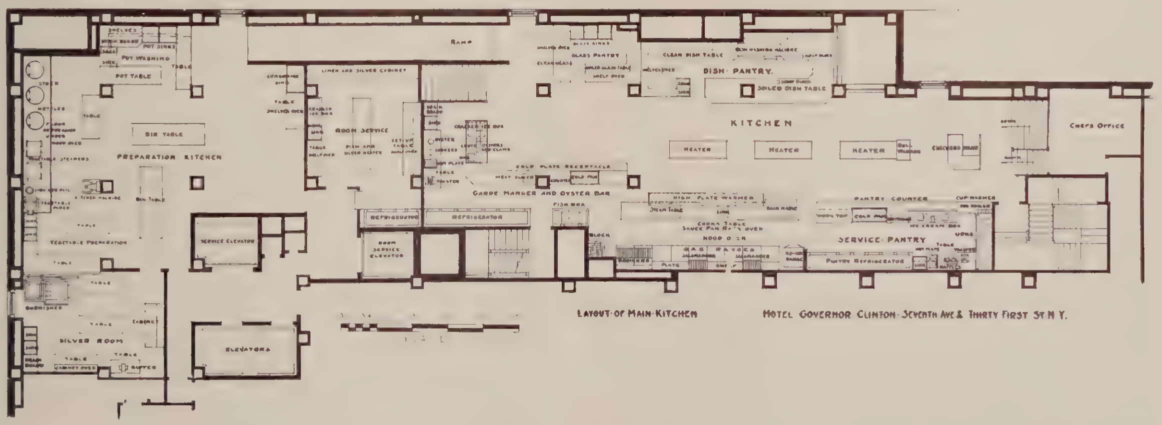
"Cook's Table top to be 10′ long, 30″ wide, and 34″ high, constructed of heavy gauge Monel metal, with edges turned down 1½″ and corners welded. Table top is to be supported on iron pipe stand, furnished with galvanized iron shelf 10″ above the floor. The top of Cook's Table is to have opening to accommodate Steam Table specified hereafter.

"Steam Table is to be 52″ long, 22″ wide, and is to have a heavily constructed Monel metal top, with openings for three meat pans and two gravy jars. Water pan is to be of heavy cold rolled copper tinned on the inside and 7″ deep. Steam Table to have waste and water filling connections and to be arranged for steam heat.

"Service Plate Warmer is to be 10′ long, 15″ deep and 48″ high. The top of Warmer to be 20″ wide, extending over front and ends 1½″, the rear extending over top of Cook's Table, and is to be of heavy gauge Monel metal with edges turned down 1½″ and corners welded. The body of Warmer is also to be of Monel metal mounted on 8″ legs and is to have four horizontal sliding doors across the front. Warmer is to have three shelves, counting the bottom as one, and is to be arranged for steam heat."

Cafeteria, Lord Baltimore Hotel, Baltimore
W. L. Stoddart, Architect

Under these circumstances it is entirely conservative to say that from 10 to 20 important features of quality are subject to variation at the option of the manufacturer. On another page there are shown comparative diagrams of two fixtures of this type, and a brief study of the data will make it quite evident that neither superficial appearance nor a general specification is sufficient to determine the true quality. The two pieces of equipment shown in the diagrams look so nearly alike that they might easily be confused, and either of them would fit the specification given here. Yet in the details of their construction they are so far apart that to compare their prices on an equal basis would be absolutely unfair. Without taking into consideration the



Main Kitchen, Hotel Governor Clinton, New York
Mergatroyd & Ogden, Architects

slighted workmanship which might accompany cheapened construction, the poorer fixture would probably cost 25 per cent less to manufacture, and yet its value per dollar to the purchaser would be far less than that of the better product.

The occurrence of any such disparity in quality between competing bidders will be largely blocked by the adoption of a more comprehensive and definite specification than that just quoted; the better specification would read, in part:

Cook's Table With Steam Table and Service Plate Warmer

"Cook's Table top to be 10′ long, 30″ wide, and 34″ high, constructed of heavy No. 12 gauge Monel metal, No. 3 grind, satin finish and to have a neat rolled rim 1½″ on working side and both ends with corners welded solid and finished smooth. At the rear, the table top is to be turned up against the back of Service Plate Warmer and to extend up to the underside of serving top of Warmer and trimmed with 2″ No. 12 gauge band Monel, No. 3 grind finish. Table top is to be supported on 1¼″ iron pipe stand, flanged at top with malleable rail fittings and cross rails all around, and furnished with ball feet. Resting on cross rails of stand there is to be a slatted band iron shelf, galvanized after made. Bands to be spot-welded to galvanized angle cross braces. Ends of bands neatly curved to fit around cross rails of stand, to be made in suitable removable sections. The top of Cook's Table is to have opening to accommodate Steam Table specified hereafter, opening to be reinforced underneath with 1½″ No. 10 gauge Monel angle, angle edge protruding ¾″ inside of opening on which the Steam Table top will rest, so that the top of Steam Table will be perfectly flush with top of Cook's Table."

As can be seen, this specification calls definitely for the better quality of fixtures, and it could not in any fairness be filled by a product of inferior construction.

But even the best of specifications cannot take the place of intelligent analysis, and the nature of the equipment used in kitchens and restaurants requires that constant vigilance be used in order both that quality may be protected, and that manufacturers may be enabled to bid under the most advantageous conditions. Some latitude must be allowed, but this must be under tight rein. Every variation that is permitted in the original specifications should be thoroughly analyzed and its value weighed accordingly.

Standardized vs. Made-to-order-Equipment. To say that kitchen equipment products are in urgent need of standardization, both as to sizes and designs, sounds like a vague generality. That this is a practical and not academic problem will quickly be seen when it is said that to manufacture a single fixture,—a steam table, for instance,—costs from 10 per cent to 20 per cent more than would be the case if the product were made in lots of from six to a dozen,—and yet this does not begin to tell the story, for manufacturing products a dozen at a time in no way approaches "quantity production." What is needed is a condition which will permit the building of 100 or more fixtures on a continuous production schedule, and when this happens it will not only bring about a drastic reduction of costs but in all probability a further improvement in quality.

Without the active help of architects and restaurant operators, little can be done. Architects can discuss the problem thoroughly with the kitchen specialists who are coöperating with them and encourage the use of standardized designs and sizes wherever possible. Any kitchen outfitter who does not respond to this invitation with enthusiasm may be charged as seriously lacking in progressiveness.

Developments in Refrigerators. A commentary upon the subject of kitchen apparatus would be incomplete without mention of refrigerators and cold service fixtures. Here, too, a general raising of standards is to be observed. One interesting new development is the improved use of individual self-contained refrigerating units for single fixtures in isolated locations.

On the whole, it is agreed that our mechanical refrigerating machinery is very efficient, and that, barring some unexpected new discovery, further improvement will be in the nature of refinement. In view of this the most hopeful opportunity for bettering performance seems to lie in planning the refrigerator itself. Taking the heat out of the refrigerator is only half of the problem; it is just as important to prevent heat entry. Thus refrigerator insulation becomes a very live topic, and as we study it we are finding that many of our old ideas are incorrect. Through the findings of the United States Bureau of Standards and other scientific agencies, it has been shown that the last word about refrigerator insulation has not yet been written, and that there are new substances available which will materially better present performance. For example, one such material, composed of a vegetable fiber, is reported by the Bureau of Standards as being approximately 25 per cent more efficient than the average insulation used today. Non-corrosive alloys are being used largely in refrigeration box construction in place of wood. The result is a stronger, more efficient, more uniform and attractive product.

REQUIREMENTS OF HOTEL GARAGE DESIGN

BY

ROGER B. WHITMAN

THE providing of accommodations for automobiles has long been part of the service of a hotel to its guests, but only of late years has it been recognized as an important factor in the business of hotel keeping. With the increase of automobile touring and the use of cars for business travel, garage conditions are now known to have a direct bearing on the success of a hotel, and for this reason they should be taken into consideration from the inception of any hotel project. Dependent on his car for transportation and desirous of making the most of the daylight hours, the traveler is attracted to the hotel that, other things being equal, allows him to go from his car to his room with the least exertion and permits his departure at the shortest notice. From this point of view the maintenance of a garage is justifiable even when it does not show a consistent profit, for a deficit may reasonably be charged to service and to promotion.

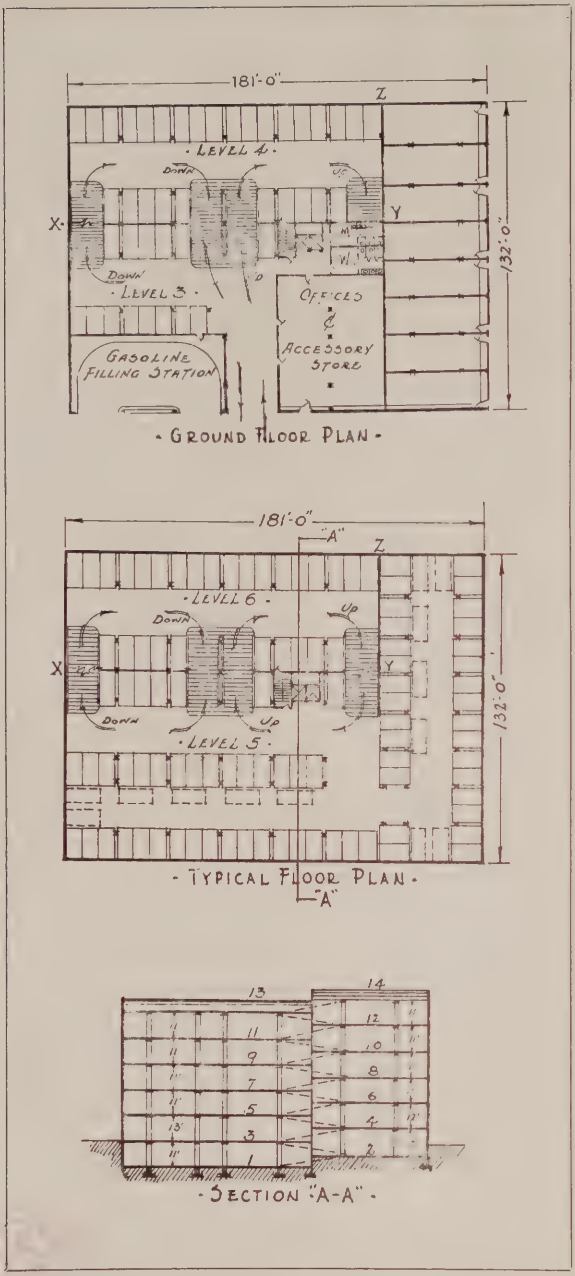
General Conditions. In its relation to a hotel, a garage is in the same category as a laundry in performing a service necessary to the comfort of the guests. As with a laundry, a garage may be owned and operated by a hotel, or it may be a business separately owned and managed but with an agreement by which the hotel may or may not profit. If it is of outside ownership but bears the hotel's name, the house will suffer from delays or other poor service, and for this reason it should protect itself by having some form of control over the management.

Handling Peak Loads. A garage supported by a hotel alone will be subject to peak loads of two classes, and will earn its prestige by its ability to handle them without delays and interruptions. One peak is annual, and will be at its height during the vacation season. The other peaks will be of daily occurrence and will be due to the exodus of a majority of the guests during a brief period in the morning and their arrival during a similarly brief period in the late afternoon. The meeting of the annual peak requires the provision of sufficient floor space for the storage of the maximum number of cars, while the handling of the daily peaks calls for design and organization that will permit the prompt delivery of any desired car and the immediate housing and unloading of arriving cars without congestion. Keyed to these peaks, there will be losses during the slack periods through unused space and idle employes, and overhead can be held down only through design that will give satisfactory service with a staff of minimum size. It may be possible to use the garage facilities for other purposes, as, for instance, the storing of cars of local business people during the day when the hotel load is light, although this is usually more practicable with a garage separate from the hotel than when it is on the property.

Ideal Service. The maximum of service will be rendered when a guest can go from his car directly to his room, have free access to his car, and be able to take it out when he pleases, a condition that is possible only when the garage is part of the hotel. This is now the accepted treatment, and one that is being commonly adopted. Success is dependent on design, however, which in turn will depend upon the general operating plan and the proposed balance of income plus the

Interior and Exterior of the Statler Hotel Garage, Buffalo

George B. Post & Sons, Architects



· GROUND FLOOR PLAN ·

· TYPICAL FLOOR PLAN ·

· SECTION "A-A" ·

Staggered Floor Ramp. Garage for Statler Hotel
Buffalo

Typical Floor Storage. Berth Storage, 98 Cars at 244 Sq. Ft. Per Car; Aisle Storage, 13 Cars; Total, 111 Cars, 216 Sq. Ft. Per Car

value of the service to be rendered against expense and overhead.

It is obvious that income will increase as more cars are stored in a given space; but this on the other hand will usually lead to a slowing down of delivery time, the need of more employes, and greater risk of accidents that may result in damage suits. Reducing the number of cars gives more handling space, and accurate driving then not being so necessary, fewer employes will be required through permitting owners to park their cars themselves.

Inter-floor Travel. The problem of design is simplest when a garage occupies but one floor and is on the street level. This will rarely provide sufficient area, however, and there must then be a selection of means for inter-floor communication. The choice will be between ramps and elevators, the former operating by the power of the cars and therefore without expense to the garage, and the latter requiring the purchase of electricity. Neither is best for all conditions; choice will depend on available floor space, the desired facility in handling peak loads without congestion, and other local and individual considerations.

Ramps. In buildings of usual design, ramps will be long, and whether straight or curved will call for skill in driving that may be beyond the average driver; in such cases, cars will usually be handled within the garage by trained employes. In the d'Humy ramp garage the staggering of front and rear floors permits the ramps to be short and straight; they are safely negotiable by drivers of ordinary ability, and their use greatly reduces the chance of accident. Ramps of two-car width, especially when arranged for one-way traffic, allow maximum speed in receipt and delivery, for there is free communication between every stall and the street. It has been shown in practice, however, that while owners will drive up one or two levels, they may be unwilling to go much higher. If this is necessary, they will leave their cars on a lower floor for further handling by employes, who will be required in greater numbers as the height of the building is increased.

Elevator Systems. With elevators, all levels are equally accessible, and a number of plans are in operation or proposed for maximum utilization of space and for a reduction in the number of employes through automatic handling. In ordinary design an elevator that may be of two-car capacity connects on each floor with a runway to the stalls, cars being driven in and out by employes. The Kent Garage in New York provides machinery for the handling of a car from the entrance, where it is left by the owner with locked controls and doors. By a series of power-driven dollies it is loaded onto an elevator, placed in a stall and when wanted moved to the exit door. Lateral shifting devices are provided for the utilization of spaces wider than the elevator. Another system is based on elevators carrying six cars on two decks at right angles, and fitted with tilting runways for unloading by gravity. Similar tilting runways in the stalls return the cars to the elevator. In the Rotafloor system the elevator is surrounded by a rotatable ring of sufficient width for radial parking, the rotation of the ring bringing any stall into line with the elevator for the reception of a car or for its delivery.

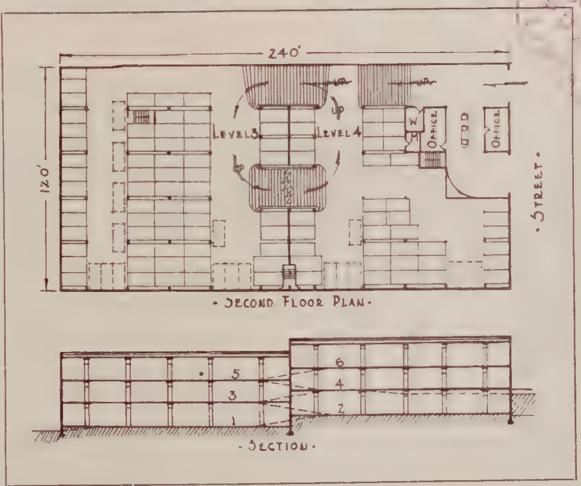
Set in a large floor, cars cross it to parking spaces in other parts, the ring being used for storage only when the other stalls are occupied.

Such systems utilize floor space to maximum efficiency, and for certain types of garage, as well as in reduction of personnel, they are undoubtedly of great value. When supplying garage accommodations is part of the service of a hotel to its guests, however, there is more than this to consider, for the slowness of elevator service may lead to dissatisfaction. An elevator averaging two minutes to the round trp, including loading and unloading, would be operating at as high speed as could usually be expected; but the limit of 30 cars an hour that could thus be handled by a one-car elevator is likely to be too little to meet the daily peaks.

Ramp-elevator System. When but three garage floors are provided,—basement, street floor and first floor, or sub-basement, basement and street floor,—the ramp system will give quicker service, while for a greater number of floors it is probable that the best results can be had with a combination of ramps and elevators. In this case, cars would discharge their loads on the floors connected by ramps and would remain there until the subsiding of the rush gave time for the employes to remove them by elevator to the storage floors. The outgoing peak would be prepared for by returning the cars to the ramped floors. With the ramped floors serving as reservoirs to absorb the peaks and the elevators for later distribution and earlier collection, this combination should provide the maximum of speed and convenience.

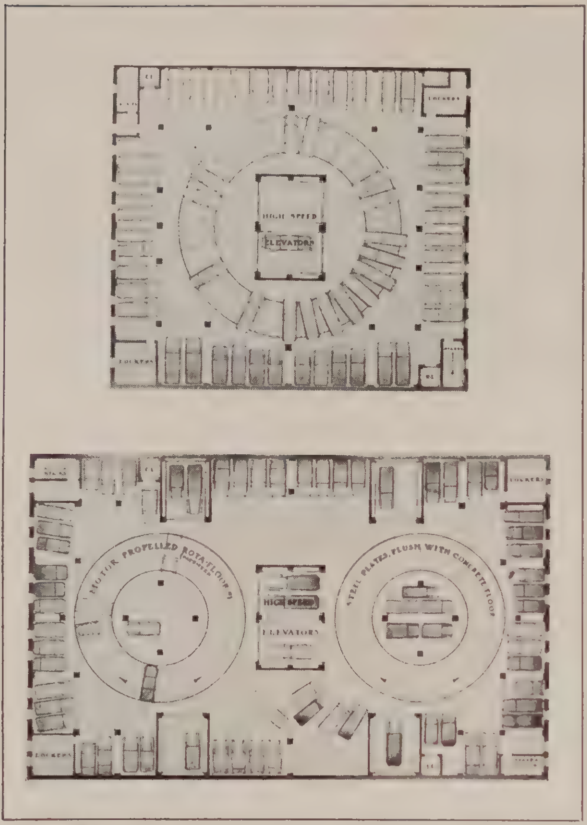
Parking Machine. The Westinghouse parking machine recently introduced should have consideration for certain uses, for while the units are at present limited in size, they can be arranged in batteries of large gross capacity. This machine consists of two endless chains passing over wheels top and bottom, with platforms suspended between them of a size for one car each. Any platform can be brought to the entrance level by the pressing of the appropriate push button, and a car driven into the machine occupies its platform until called for. An existing installation provides storage for eight cars, and it occupies no more ground space than an ordinary two-car garage.

Facilities. As a garage management will be held responsible for the care of cars and other property in its charge, theft should be guarded against by providing but one entrance and exit, an arrangement that also facilitates checking in and out. At this point the design should also include a sales space, for revenue from the sale of gasolene, oil, tires and other accessories should amount to a considerable percentage of the total income. Here also there should be a waiting room to which baggage can be brought, and for use of guests whose cars are being serviced or otherwise detained. The importance of this part of the project becomes apparent when it is realized that to guests traveling by car, the first impression of a hotel will be made by its garage.

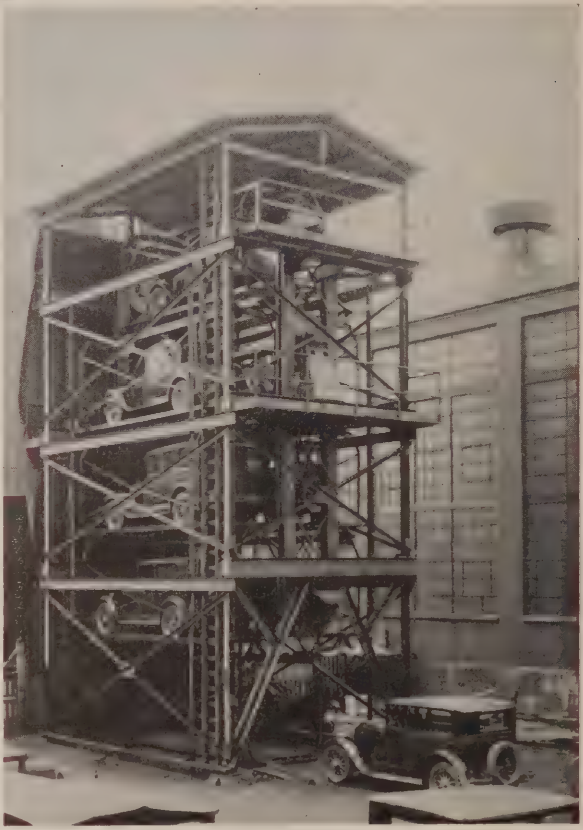


Exterior, Interior, Plan and Section of a Staggered Floor Ramp Garage. Olympic Hotel Garage, Seattle

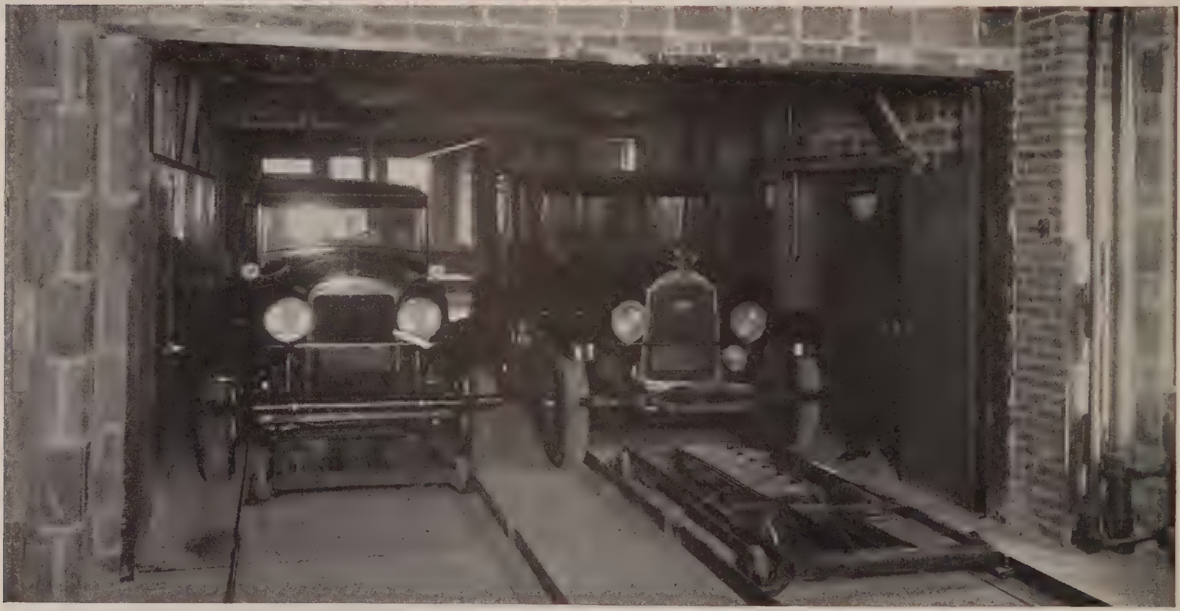
Robert Reamer, Architect


HIGH SPEED
ELEVATORS
LOCKERS
MOTOR PROPELLED ROTA-FLOOR
STEEL PLATES, FLUSH WITH CONCRETE FLOOR
HIGH SPEED
ELEVATORS

Garage System that Combines High Speed Elevators and Rotating Floor Section



An Elevator Parking System Built on the Principle of a Continuous Belt



An Elevator Garage System which Permits Cars to be Locked by the Owners. Subsequent Handling and Parking are Accomplished by Means of the Trucks Shown

HEATING AND VENTILATING OF HOTELS

BY

HARRY J. CULLEN

CONSULTING ENGINEER

THE usual method of heating a hotel is by direct radiation, generally located under windows and exposed in bedrooms, stores, etc., but concealed in the main lobby, dining rooms, ball rooms and other public spaces.

The type of heating system in a commercial hotel building is usually a two-pipe, down-feed, vacuum return. An attic space of about 6 feet is provided at the top of the building below the main roof, where the steam main is run from a main steam riser located in a main pipe shaft extending from the boiler room up to the attic space. The attic space also contains ducts for bathroom ventilation and plumbing pipes. The object of running steam mains in the attic space is to gain more head room under return mains on the basement ceiling, as rentable space is usually available in the basement for billiard rooms, barber shops, boot black and coffee shops, etc.

One Pipe Steam. There are various types of direct steam heating systems that may be applied to the average hotel. There is the one-pipe steam heating system with an air valve on each radiator. This system is the cheapest to install, but the disadvantage is that in a fairly high building the steam risers will be too large, as the condensation from the radiators flows back in the steam risers and mains to the boilers, and if large pipes are not provided there is the possibility of waterhammer in the mains. The air valves, if not of a good make, will require readjustment frequently, as one may have seen steam or water escaping from many air valves on radiators. If a good type air valve is used, this trouble will be eliminated, but it is an easy matter for anyone requiring an air valve to "lift" one from any radiator in the hotel.

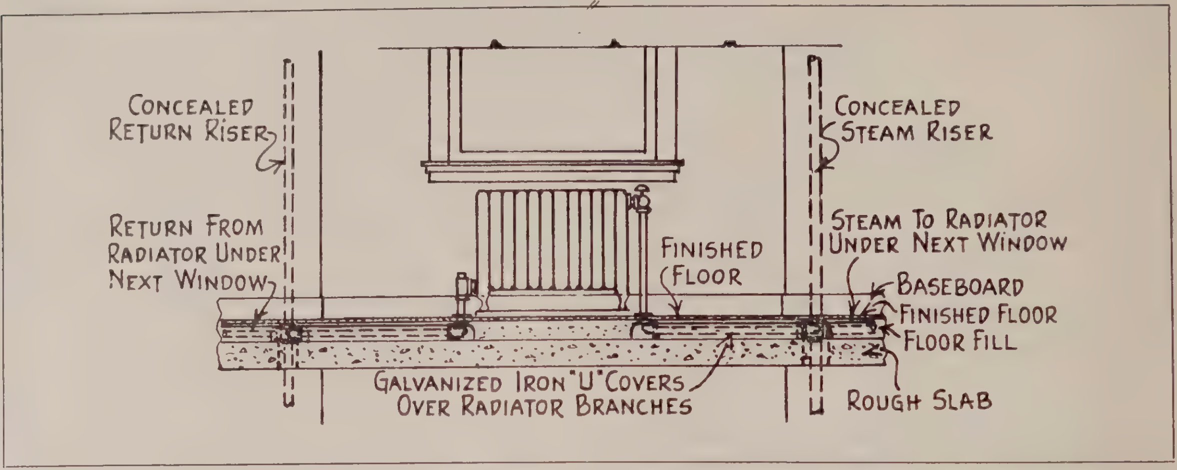
Air Valves. A one-pipe steam heating system, when starting up, requires considerable time before the radiators are all hot, as all the air in the system must be expelled through the small holes in the caps on the air valves. If vacuum air valves are installed, they prevent the air from reëntering the system when the fire in the boiler is banked. But if this type of valve is used, the joints in the pipes and packing around the valve stems must be absolutely tight, or the air will leak into the system again at these points.

Two Pipe Vapor. Another type is the two-pipe vapor system, which has an advantage over the one-pipe system, as it does not require any air valves on the radiators, the air being removed from the system by an air eliminator located in the boiler room. This system supplies steam to the radiators at or slightly above atmospheric pressure (212°) and is generally used in smaller hotels or bank buildings, but in large structures requiring about 2 pounds pressure in the boilers due to loss of pressure in mains, this pressure would blow the seals out in the return connections on the radiators.

Two Pipe Gravity. Still another type is the two-pipe, open end, gravity return system. It has an advantage over the vapor system, as the steam pressure can be 2 or 3 pounds in the boilers, and may be raised to 5 pounds if necessary during cold weather. This type of system also has an air eliminator, or alternating receiver, located at the boilers, which allows the air in the system to escape, and returns the condensation to the boilers. The radiators for this system are of the hot water type with a moderating valve on the steam connection at the top of the radiator on on end, and a thermostatic valve on the bottom of the radiator at the opposite end. The modulating valve may be opened as required to allow a certain amount of steam to enter the radiator to keep the room at a comfortable temperature. The thermostatic trap valve permits the condensation to leave the radiator, but does not allow the steam to escape into the return risers; when the steam comes in contact with the thermostatic element in the radiator trap, it expands and shuts the valve until the steam condenses, then opens, permitting water to flow into the returns.

Hot water systems of heating are rarely used for heating hotels. It is an excellent system to install in residences, but the disadvantage is the possibility of the pipes freezing up if the fire in the boiler is allowed to go out. The hot water system would hardly do for a hotel, since some guests like to sleep with their windows wide open, winter and summer, and on a very cold night there would be the possibility of the radiator in such a room freezing up and cracking.

The Two Pipe, Vacuum Return System is about the best to install in a hotel. This system is the same as the open-return system with the exception that a vacuum pump is installed in the return system instead of the alternating receiver. This system heats up very rapidly, due to the vacuum maintained in the return mains and risers. There are also various high vacuum systems where a vacuum is created throughout the system. The advantage is that the steam under a certain vacuum can be anywhere from 180° to 212°, resulting in a saving


Concealed Return Riser
Return From Radiator Under Next Window
Finished Floor
Concealed Steam Riser
Steam To Radiator Under Next Window
Baseboard
Finished Floor
Floor Fill
Galvanized Iron "U" Covers Over Radiator Branches
Rough Slab

Detail Showing Radiator Branches in Floor Fill

of steam, but this type of system must be absolutely tight to prevent any air leakage into the system. There are many makes and types of radiator valves and traps. The supply radiator valves may be either packless, modulating type with indicator plates, or the quick-opening, packless type; either type can be furnished with lever handle or wheel handle. The radiator return traps are either of the disc type, the metal bellows type, or the expansion type. The radiators used in a hotel are usually cast iron, plain pattern, of the new tube type.

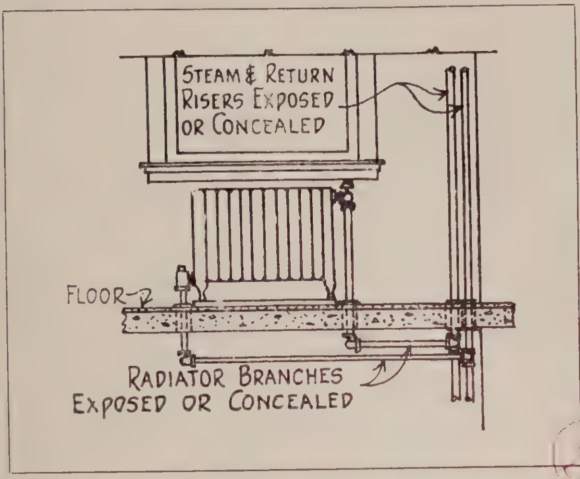
New Type Radiators. Fantom type radiators are frequently installed in bedrooms where metal windows and sills are provided, and hung on special hangers from window sills. Where wooden frame windows are used, the tube radiation is often installed, either legless and hung under sills, or the leg type radiation set on cement bases extending about 1 inch above the finished floor. This cement pad allows the carpet to finish around it. Fin radiation is also sometimes used under window bulkheads in stores and shops in a hotel, with a grille located on the face of the bulkhead; and the radiator enclosure is lined with galvanized iron and asbestos board. Wall type radiation is frequently used on ceilings of basement rooms requiring heat, and also in toilet rooms having high window sills, and sometimes in house tank rooms on the roof, instead of pipe coils, and where space conditions are limited, such as on stairways, in corridors, etc.

Radiator Location. In placing radiators, the usual practice is to locate them under windows, but in some hotels, to save expense, radiators have been placed at side walls near windows and close to risers. This arrangement permits a higher radiator to be used, a type which is less expensive than a low radiator, and it saves considerable piping for radiator branches, as the radiator is located nearer the risers. However, it may interfere with furniture.

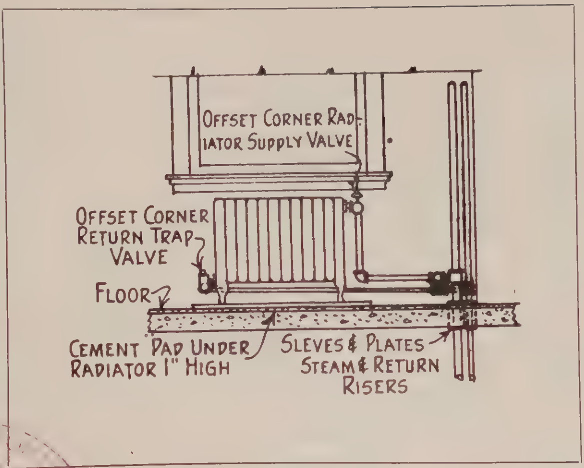
Vestibules. In vestibules concealed radiation is installed, as these entrances are in most cases provided with revolving doors that prevent excessive air leakage. In some of the larger hotels, a small hot blast system has been installed in vestibules, the system consisting of a fan, motor heater, connecting duct work and registers, and arranged so that air is re-circulated and heated from about 60° to 100°, and discharged into the lobby, thus creating a slight pressure and preventing a large influx of cold air and heating up space very quickly.

Baths. The bathrooms are frequently heated by means of fin radiators, having metal covers, with enameled finished baked on, and the radiators are located under traps from lavatories. These small radiators are of about 3½ square feet of radiation each. The advantage of using this type of radiators is that they are light in weight and do not require radiator hangers and are supported by the pipe connections to the radiators. The risers for the bathroom radiators are run in pipe shafts for plumbing pipes, and the radiator branches run in the furred ceiling of the bathroom below, as the bedroom floors are typical and the bathrooms are located typically one above another. The branches to a bathroom radiator should be arranged to come out through the side wall of the bath instead of through the floor, as openings in the floor, if not tight, will permit water leakage through floor sleeves to the room below when mopping the floor of the bath.

Radiators, when placed against side walls and under windows, should be provided with metal covers on top to prevent the wall above the radiator, and window curtains, from becoming soiled by dust. Where fantom radiators are used and



Radiator Branches on Ceiling Below



Radiator Branches Run Above Floor

located under windows, with a metal window sill projecting over, the metal sill should be solid and not perforated, the top of the radiator being located about 1 inch below the lowest point of the sill to allow for circulation of air. This method will prevent dust's collecting on the curtains and draperies of the windows, and they will not require as frequent washing as with the perforated sills. Consequently, they will last longer. There are various types of radiator covers, and some have marble tops and water pans to moisten the air, if required.

Figuring Radiation. In figuring exposed radiation, the usual allowance in B.t.u. losses are made for wall, glass and air leakage, and other exposures, such as roof, etc., and percentages are added for exposure, such as for north, west, etc. Allowance should also be made for bathroom's exhaust ventilation in figuring the radiation for a bedroom. For fantom type radiation enclosed on sides, top and bottom, 8 to 10 per cent should be added to the square feet of radiation required in a room; for enclosed radiation 25 per cent should be added to the amount of radiation required in a room. The front and top grilles for an enclosed radiator should be at least 12 inches longer than the radiator, and the grilles should be provided with access doors for reaching valves on radiators. The supply valve on an enclosed radiator should have an extension spindle to face or top of enclosure for easy operation of the valve.

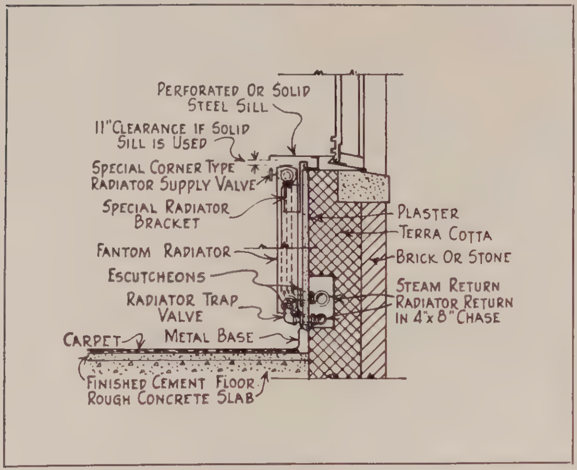
In figuring the amount of direct radiation required for a store or a vestibule, from 25 to 50 per cent should be added to the radiation to allow for excess air leakage every time outside doors are opened, where revolving doors are not used. Where a hot blast system is used to heat a vestibule, the amount of heated air required and the final temperature of it must be determined in designing this type of system, based on the heat losses for these spaces.

Direct-indirect radiation is rarely used in hotels, but unit ventilators are sometimes used for ventilating various spaces, such as ball rooms, convention halls, club rooms, etc.

Piping. Steam and return risers may be either run exposed or concealed in the bedrooms. In lobbies, etc., they are run concealed. Risers are generally located at columns, and where concealed, are furred. If risers are run exposed, they may be either bare pipe and painted, or covered with asbestos, and the pipe covering protected with a galvanized iron casing, about 7 feet high. The radiators in the lobby, writing rooms, lounges, dining rooms and similar spaces are generally concealed, as these are finished rooms. The radiator enclosures are provided with front or front and top grilles, or a grille in the sill. The fronts of radiator enclosures should be made removable, or if a large grille is provided in the front of the enclosure, it should be large enough so that the radiator could be removed through it in case of its needing repairs. This also applies where a small grille is provided in the front and a grille in the sill. The latter grille should be large enough so that the radiator could be lifted out through the top of the enclosure.

Radiator branches may either be run from risers to radiators above the floor, exposed, or in floor fill protected with U-shape galvanized iron covers, or exposed on the ceiling below, or they may be furred in over window heads, or run in a horizontal pipe chase back of the baseboard in bedrooms. The method of running the radiator branches is for the architect to determine. The radiator branches for radiators in lobby, dining rooms, etc., are usually run in the floor fill.

The medium pressure steam and high pressure

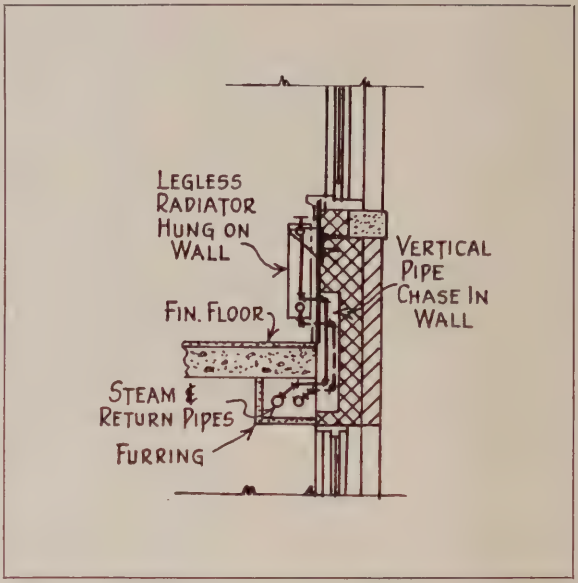


Hung Radiator with Metal Window

steam piping should be covered with 85 per cent magnesia covering, and re-canvased; the low pressure, steam returns and drip piping covered with air cell covering. The steam and return risers are usually covered with ¾-inch thick covering, the radiator branches with ½-inch thick covering, and the mains with 1-inch thick covering. The boilers, smoke brushing and hot water tanks should be covered with 1-inch thick 85 per cent magnesia blocks wired on over a 1-inch air space, and ½-inch coat of asbestos cement applied over blocks troweled to a smooth finish.

Boilers. Various types of boilers are used, depending on the service required. In a small hotel, without a laundry, and with the kitchen using gas instead of steam, low-pressure, cast iron sectional boilers are installed to heat the building and for hot water supply, thus saving excavation. In a larger sized hotel, having a laundry (which requires steam at from 80 to 100 pounds pressure) and a kitchen (which requires steam at from 30 to 40 pounds pressure), water tube boilers or fire tube boilers are usually provided, built for 100 pounds working pressure. Many new hotels are installing electric generating plants, also steam-driven refrigerating plants, as the exhaust steam from the engines, ammonia compressors, pumps, etc., is available to heat the building in the winter, for heating the water required for the hotel, and for heating the boiler feed water. As a hotel with a laundry requires steam at from 80 to 100 pounds, the steam electric generating plant can also be operated at this pressure, and where rates are high, a hotel with its own plant can often generate electricity more economically than it can purchase it.

Boiler grates are generally furnished to burn buckwheat coal, and in some cases soft coal or run of mine coal, in which case they are provided with forced draft and automatic stokers.



Method of Concealing Radiator Branches

The type of coal burned depends on the location of the hotel, the grade of coal, and the price obtainable. In some locations, the boilers are arranged to burn natural gas. A fair sized hotel will require about from two to three 200-horse power boilers, and will require a ceiling height in the boiler room of about 20 feet. The sizes of the boilers depend on the steam required for heating, ventilating, hot water supply, kitchen, laundry, etc. In smaller hotels it is usually customary to install two boilers, both built for 100 pounds working pressure, the smaller boiler being a sufficient size for kitchen and hot water supply, and the larger size boiler having sufficient capacity for the total steam requirements. It is an advantage to have a spare boiler in case one boiler breaks down.

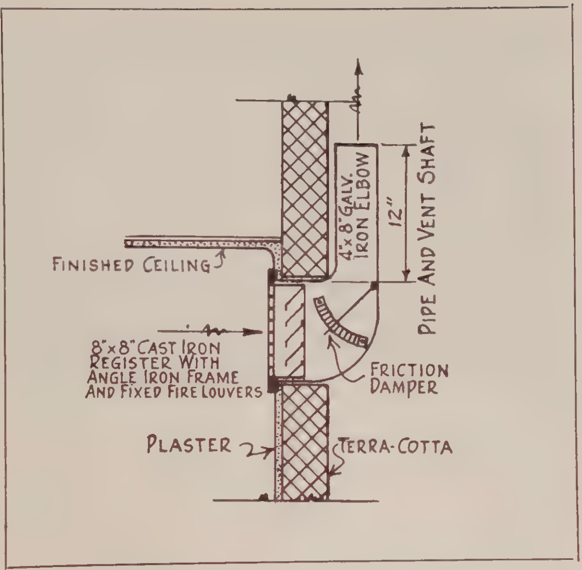
Where low-pressure boilers are installed and the heating system is of the vacuum type with vacuum pumps, it is desirable to install a small summer steam boiler for hot water supply. The hot water heater should be cross-connected with the large boilers and the small summer boiler, and the drip from the heater cross-connected to the vacuum return, and to the summer boiler return, and provided with a quick air vent. This is desirable so that the heater may be used without its being necessary to operate the vacuum pumps in the summer. In some hotels the owners want separate steam mains to radiation in public spaces and stores, so that steam may be shut off in the bedrooms during the night, but will be available in the public spaces.

Ventilation. The hotel generally needs supply and exhaust ventilation in all spaces in the basement, in the lobby, main and private dining rooms, ball rooms, convention halls, bathrooms, private offices, cafeteria, coffee shops, etc. Very often, however, when the hotel is rented to an operating company, the management does not operate the complete ventilating systems because it costs too much for the steam and electricity required. The result is that they operate only the kitchen exhaust system and the bathroom exhaust system. In one hotel the firemen were using the air washer for a coat closet, and the engineer had disconnected the air washer pump and was using it for another purpose.

In designing an economical ventilating system for a hotel, supply and exhaust ventilation is provided for the barber shop, boot black room, billiard room, public toilets, and other public spaces in the basement. Exhaust ventilation is provided in the main kitchen, cafeteria kitchen, serving pantries, main dining room and lobby; and exhaust ventilation is provided for interior bathrooms.

Kitchen Ventilation. In the kitchen, which should have outside windows and skylights, exhaust ventilation is taken out through the range hood, dish-washing machine hood, coffee urn hood, and from over bake oven and pastry stove. From 20 to 30 air changes should be provided per hour depending on the size of the kitchen and the kitchen exhaust fan, located in the fan room and on the roof over the kitchen. In some kitchens, fresh air has been provided in front of the ranges by swivel outlets, but in many cases the chefs have blocked up the fresh air openings as they object to the drafts. A perforated steam pipe must be located in the range hood so that steam can be turned on in case of fire in the hood, and the kitchen exhaust fan should be provided with an electric thermostat to shut off the fan in case of fire in the flue.

Public Room Ventilation. If supply and exhaust ventilation is to be provided in the lobby, etc., the supply should be taken into the room at about 7 or 8 feet above the floor (depending on the ceiling height), and some exhaust be taken out near the floor and at the ceiling (for smoke), and the registers arranged in these rooms to get a good distribution of the air. Ball rooms and convention halls should be provided with both supply and exhaust ventilation on separate systems, the fans being located in fan houses on the roof above these spaces. The supply registers should be located on the side of the room where the windows are located, about 7 or 8 feet above the floor, and the exhaust registers located opposite the supply registers, some near the floor and some in or near the ceiling. This arrangement will permit the exhaust system to be operated alone in the summer time when the windows may be opened for ventilation.



Vent Register for Interior Bathroom

Boiler Room Ventilation. The boiler room in a small hotel is not usually ventilated, but there is an ash hoist shaft provided to the sidewalk level which is ample to ventilate a small boiler room. In larger hotels, forced draft is provided for the boilers, and the air is taken from the boiler room for this purpose. The air supply is through either openings or windows to outdoors or through the ash hoist shaft. Where steel smoke stacks are installed within a masonry enclosure, the space between the stack and enclosure is open at the top and bottom and this space can be utilized also for ventilating the boiler room. A hood placed over the top prevents the rain from coming in. Engine rooms should be provided with both supply and exhaust ventilation, the supply registers located on one side of the room and the exhaust ventilation registers located over engines (which give off considerable heat) if possible.

The basement floor, where below grade, is not usually heated (with the exception of barber shops, public toilets, etc), as the heating mains located at the ceilings of these spaces give off considerable heat, but plugged outlets can be provided in mains so that wall type radiation or pipe coils can be installed on the ceilings of these spaces at any time, if required.

Ventilating Interior Baths. The interior bathroom is usually ventilated by means of a register located near the ceiling, connecting to a galvanized iron elbow having a friction damper and turning up 12 inches in pipe shaft. The bathroom registers must be provided with fixed fire louvers, and the tops of the pipe shafts are connected by ducts to the bathroom exhaust fan

Necessary Exhaust Ducts over Kitchen Range are Shown in this Hotel at Concord, N. C.

Supply Grilles under Mezzanine, Exhaust Grilles in Ceiling, Lord Baltimore Hotel, Baltimore

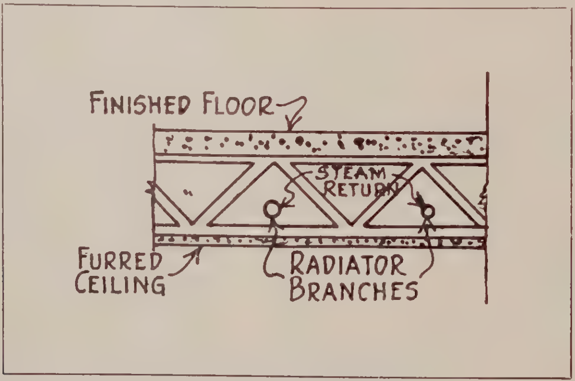
suction. The bathroom exhaust fan is usually located in the fan rooms provided under the house tank. Slots or grilles are provided at the bottoms of the bathroom doors, to allow circulation of air through the bathrooms. The best practice is to install galvanized iron vent flues in pipe shafts connecting to each bathroom register, and connecting these flues to the horizontal duct work in the attic space of the bathroom exhaust fan suction, as the masonry shafts in many cases are not tight, and with elbows turning up in shafts, they catch all the mortar, plaster, dirt, etc., dropping down the shaft from above.

Ventilating Equipment. Fan and motor foundations should consist of yellow pine frames set on cork blocks to prevent transmission of vibration to the building structure.

The fresh air intakes for fans can be taken in at any areaway or window, or from any roof or court convenient, the supply fans being located in the basement. The discharge from exhaust fans may be carried to any convenient point, but should not discharge near any window in guest rooms or near the fresh air intake. The exhaust fans may be located in the basement or on roofs where convenient. The supply ventilation system should have air filters, of easy cleaning type, and also an air washer. Tempering and re-heater stacks may either be cast iron, vento type, or fin type.

Temperature regulation should be provided in connection with the ventilating system, as well as for direct radiation in all public spaces. Direct temperature control valves may be installed on the direct radiators where required.

In some hotels 18 or 20 stories high, where the stairways open into a main lobby without any doors closing off the stairway, there will be considerable draft in winter if these stairways open at the top to the outside air or if the door to stairs at top floor is opened and windows on top floor open. The stair halls act like a large asperating flue, and there would be considerable air leakage into lobby, etc. Doors should be provided at the bottom of each stair hall to prevent these drafts. Ceilings over boiler rooms and engine rooms should be insulated with 85 per cent magnesia blocks. Ceilings over kitchens in southern hotels where the ceilings are about 12 feet high, and the sun shines on the roofs practically all day, should be insulated to prevent the summer's heat from becoming unbearable.



Radiator Branches are Easily Accommodated in Steel Joist Construction

MODERN HOTEL LIGHTING

BY

A. D. BELL

ELECTRICAL ENGINEER

AMONG the many refinements which characterize the well equipped hotel there is adequate and satisfactory artificial illumination. It serves not only for convenience, comfort and beauty but many operations of the heating plant, the laundry, the kitchens and other places are absolutely dependent upon it, as these areas are frequently cut off from all daylight. On account of their diversity of purposes the areas of a hotel logically fall into three sections; viz., guest rooms, public areas, and working spaces.

The Guest Rooms. While in general the guest room is used in the same manner as the bedroom in a residence, it must also serve at times as a living room, writing room, and office. The first requirement is a medium level of general illumination for the entire room. A central semi-indirect fixture or an enclosing globe is in general sufficient for this purpose, controlled by a wall switch near the entrance door. Many hotel operators prefer to have this switch operate a small light near the room entrance, so that when two persons share a room the one coming in late will not flood the room with light and so disturb one who may have retired. A local dresser light is essential, either suspended over the dresser or connected to a baseboard convenience outlet, and using in most instances 40- or 50-watt lamps. A bed light with a metal or fabric shade is a desirable feature, and it will generally require a 25-watt lamp. A floor or table lamp attached to a baseboard convenience outlet and a light for writing should be considered. The well appointed guest room has a light in the closet, which is a great convenience. Either the automatic door switch or the pull chain may be satisfactorily used for its control. The hotel bathroom is generally lighted by means of a pear-shaped glass reflector, the unit being placed directly over the lavatory mirror. This arrangement provides illumination for shaving and also for the whole room, but a light on each side of the mirror is better, although not often found. A fixture that provides a receptacle for electrical appliances, such as curling irons, vibrators, etc., is a great convenience.

For parlors or living rooms in connection with the guest rooms, a central ceiling fixture controlled by a wall switch is often found. Semi-indirect illumination is excellent, although other types of fixtures may be entirely satisfactory with one or more floor or table lamps. Many hotels have their larger guest rooms equipped to function as sample or display rooms in addition to the regular sample rooms. In rooms of this type, enclosing glass globes, spaced symmetrically on centers from 8 to 10 feet apart, employing about 2 watts per square foot of area, make a satisfactory installation. Convenience outlets with adequate capacity are also necessary.

Public Areas. In the lobby, dining rooms, mezzanines, etc., the accepted ideas on lighting are certainly quite different from those of a decade ago. The so-called "modernistic" lighting is being very extensively employed, and in appearance at least it is quite different from the "period" fixtures widely used previously. The period fixtures, while beautiful in a decorative sense, have

The Guests' Rooms Need a High Standard of Illumination with Lights Properly Placed. Bedroom Shows Central Semi-indirect Ceiling Fixture and Separate Lights for Dresser, Desk and Bed Table

Modern Lighting Fixtures of Frosted Glass Panels. Central Fixture Equipped with 13 25-Watt Lamps

Writing Room with Modern Fixtures for General Lighting. Ceiling Fixtures have 100-Watt Lamps

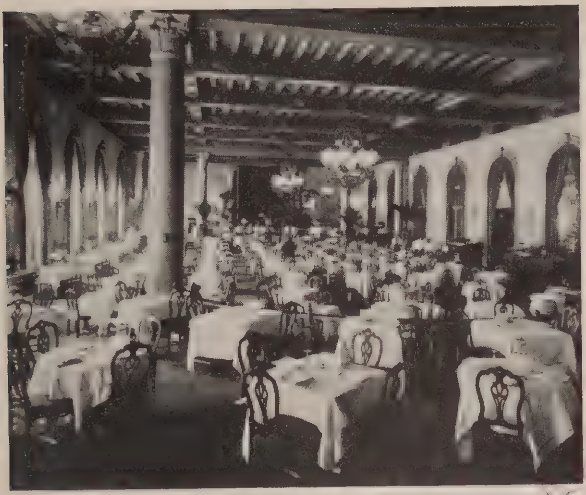
been too often unsatisfactory in regard to illumination, which is not surprising when one stops to consider that in their original forms they were made for candles and not for the incandescent lamps of today. The chief factors to keep in mind when using "modern" fixtures are: proper light distribution, low brilliance, absence of glare, and ease of cleaning and re-lamping.

The Lobby. The lighting equipment desirable for the lobby is determined largely by the type of hotel. It is the point of contact between the hotel management and the public, and may serve as an office, lounge, reading and writing room. In smaller hotels and those of the residential type all of these facilities are provided in the lobby. Enclosed glass globes with or without decorations, or semi-indirect reflectors are satisfactory for a lobby of this character. For enclosing globes, from 1 to 1.6 watts per square foot may be figured; for semi-indirect fixtures, 2 watts per square foot. Occasionally wall brackets are the chief sources of general lighting, being supplemented at times by suspended fixtures of the candle type. Such a scheme is fairly satisfactory, provided that all lights are shaded. Plenty of floor and table lamps for reading and writing are absolutely necessary, however, as the general level of illumination will be low.

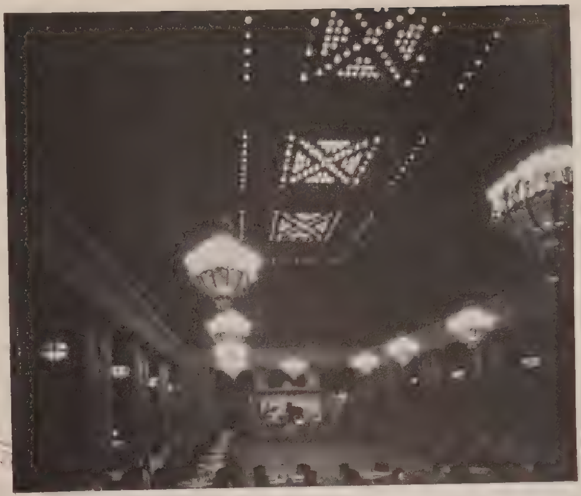
Informality and Comfort in a Grill Room, Lighted by Lanterns, Each Having a 40-Watt Lamp

For the larger lobby there are many methods of suitable illumination. Artificial skylights, cove lighting, suspended fixtures of the candle type, indirect or enclosing globes may be used. There is a choice of the older forms of fixtures or the modernistic. In any event, adequate provision for floor and table lamps should be made for reading. For the actual illumination the necessary wattage should normally range between 1 and 3 watts per square foot. Adjoining the lobby are the offices, where it is advisable to provide about 12 foot candles to facilitate accurate work. Semi-indirect or enclosing globe fixtures are desirable, the former requiring from 3 to 4 watts per square foot, and the latter from 2.5 to 3 watts per square foot. The offices of the cashier, bill clerk, etc., should in addition have local units along the front upper edge of the grille, as in a bank, with the light directed on the counter.

Dining Rooms. In this division of the hotel a variety of types is encountered, ranging from the lunch counter to the formal dining room. For the lunch room, coffee shop and cafeteria and dining places of a similar character, the illumination should be of a much higher level than in the main dining room, grill room and the like. For the former, enclosing globes or semi-indirect fixtures of a simple type are excellent, allowing



Dining Room Having Chandeliers and Brackets of the Candle Type. Local Table Lights are Provided

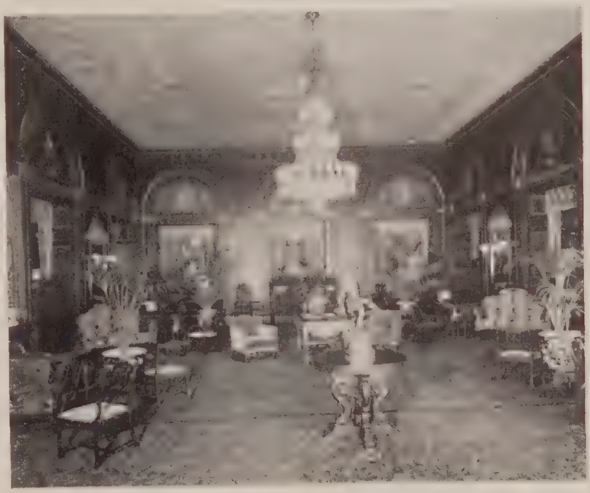


Hotel Roof Garden. Glass Panels of Skylight Give a Variety of Color Effects by Using Several Circuits

from 1½ to 2 watts per square foot for adequate illumination. The main dining room requires, first of all, a medium level of general illumination. This should be evenly distributed, and it may be provided by many different schemes. In any event local lights are desirable for the tables. In the grill room also the illumination should be of subdued variety as the guest there, too, is inclined to take time and accordingly enjoy the surroundings. Lighting fixtures appropriate to the architecture of the individual grill room will give to it a much more attractive appearance, such as is the case of a room with dark beamed ceiling where fixtures of the lantern type give the idea of the old time tavern. Supplementary illumination by means of wall brackets is sometimes desirable when the ceiling is low. A wattage of from 1.5 to 2 watts per square foot should be provided.

Roof Garden. This is mainly a place for seasons of warm weather only, and as it will be patronized for dancing as well as dining, it requires an atmosphere of festivity and freedom. Colored lighting effects may be employed, and novelty is a desirable feature. Enough outlets with a wiring capacity of at least 4 watts per square foot should be installed to allow for future equipment. Pendent lighting fixtures are sometimes used, but more often more elaborate schemes are provided, such as artificial skylights, recessed glass panels, or false ceilings of colored textiles with lights behind them. Special lighting effects for the dance floor are often obtained by special apparatus such as is employed in the theater. Similar lighting effects may be well employed in the main dining room and grill room in case there is the possibility of dancing there.

Ball Rooms. The hotel ball room is used for a wide variety of purposes, from a formal dance or amateur theatrical to an automobile show, and therefore special lighting service must be provided. Central ceiling fixtures are satisfactory for general lighting purposes, and well shaded wall brackets to match give additional illumination. From 2 to 4 foot candles gives an adequate level of illumination for general purposes. In planning the wiring a large number of convenience outlets should be provided, so that the lighting for booths, etc., can be connected. It is well to run in heavy feeders terminating in a special service box for temporary installations. On the balcony and on the main floor standard stage pockets of high capacity prove most convenient for spot and flood lamps. With the ever-increasing use of colored lighting as an element of decoration, it is well to keep in mind the possibility of such effects, and to provide sufficient wiring capacity.



Soft, Restful Lighting is Provided in this Hotel Lounge by Using Chandeliers and Wall Brackets of the Candle Type

The Hotel Kitchen Demands a High Level of Illumination and Efficient Lighting Units

Good General Illumination is Needed in Lavatories, Supplemented by Local Lights over Mirrors

Lounge and Writing Rooms. Soft, well diffused illumination of a medium level is desirable, and light sources in any way glaring are to be avoided, for the guest is inclined to sit in such a place, and will notice objectionable light sources more quickly than in the lobby where there is more motion. In the writing room, the fixtures for general illumination may be similar to those used in the lounge. Small desk lamps should be provided, however, for local lighting of the desks.

Working Areas. The successful management of a hotel is due in a large degree to the proper functioning of many departments which are seldom seen by the guest. Too frequently a miscellaneous arrangement of bare lamps in ceiling sockets or on drop cords supplies the only illumination. Glaring, brilliant light sources are annoying to everyone and lower the efficiency of the chef, porter, maid or other employe.

Kitchen and Bakery. From the very nature of the work performed, these areas may be considered miniature industrial plants where quality is ever demanded at top speed. Adequate lighting allows for better supervision and preparation of food and promotes smoother and more efficient operation. Dome reflectors with white bowl lamps will provide excellent general illumination. Durable reflectors are often employed. Spacing of outlets on approximately 10-foot centers is good practice, allowing from 1.5 to 2 watts per square foot. To illuminate the ranges it is advisable to install a row of lamps on 2- to 3-foot centers along the inside front edges of the ventilating hoods.

Laundry and Tailor Shop. For the operation of washing machines and extractors a system of localized general illumination is satisfactory. Dome reflectors spaced on centers of from 8 to 12 feet will in most cases prove satisfactory. Flat work ironers generally require a localized light at both the feed and delivery ends. With ceilings from 12 to 14 feet high, diffusing fixtures mounted from 11 to 13 feet from the floor should be provided. The exact layout will depend on the arrangement of the ironers, but from 7 to 10 foot candles should be provided. Hand ironers will require a close spacing of lighting units, as this work needs a higher level of illumination. In order to detect stains, scorching, etc., in the different operations it is often advisable to employ daylight blue glass, as the resultant light will be more white in color.

Wiring. In order to insure adequate capacity for extra current loads and future development, the wiring system in a hotel should be considerably greater than for immediate demands, as many buildings today are prevented from employing modern lighting and electrical equipment because of the wiring's being of insufficient capacity to carry the required loads.

CONSIDERATIONS IN THE SELECTION OF ELEVATOR EQUIPMENT FOR HOTELS

BY

ROGER B. WHITMAN

WHILE the most evident need for elevator equipment in a hotel is the quick and convenient transportation of guests, it is quite as essential from the management's point of view to provide for swift restaurant, baggage and freight service throughout the building, for the distribution of incoming supplies, and for the removal of waste. The equipment will usually fall into two classes,—elevators running the height of the building for passengers and for service, and the more specialized elevators and hoists that operate from sidewalks to basements. The placement of these in relation to their duties and their operating costs will have a direct effect on the attitude of guests and on the success of the hotel, and for this reason the plans for their installation should be subject to the advice of the manufacturers of the equipment selected.

Relation of Service and Costs. Passenger elevator equipment should be capable of the speedy handling of full capacity traffic. This, however, must be balanced against limitations in floor space, investment costs, and cost of operation, that the fixed charges and loss of paying floor area may not be excessive for the service that is rendered. The equipment must therefore be considered from two points of view,—the favorable impression to be made on guests by quick and convenient service, and from the standpoint of the management, costs of investment, operation and maintenance. Both are affected by recent improvements that substitute mechanical and automatic operation for fallible human control, travel becoming more comfortable and capacity being increased.

Losses Through Manual Control. Speed in elevator service will be reduced, and motion will be jerky with slow approach to a stop, failure to bring a car to an immediate stop at floor level, coming to a stop before opening the doors, and delay in starting and in acceleration. To the elderly, the ailing, and to those to whom elevator travel is not a matter of course, such irregularities will be a cause for apprehension and will create an unfavorable impression, while to the management they represent losses of time and added expense. Even with expert operators they will be present in greater or lesser degree, and they can be eliminated only through the precision of mechanical control. These new devices should therefore be given full consideration.

Devices for Mechanical Control. The basic

Elevator Doors, Cosmopolitan Hotel, Denver
William H. Bowman & Co., Architects

Elevator Doors, Book-Cadillac Hotel, Detroit
Louis Kamper, Architect

Elevator, Hotel Statler, Boston
George B. Post & Sons, Architects

improvement is the automatic stopping of a car at floor levels, the action being so sensitive that there will be an immediate re-leveling of a car that sinks under the loading of great weight. The car travels at full speed until within the range of this mechanism, when de-celeration and stoppage occur smoothly and without jerking. This effect being assured, rapid unloading becomes possible through automatic operation of the doors, which begin to move during the last stages of leveling and are fully opened as the car stops. The doors are closed and the car started by the throwing of a switch by the operator. The pressing of an outside button stops the first car to approach in the desired direction, with no coöperation from the operator and without his knowledge that the stop is to be made.

Effects of Mechanical Operation. A hotel elevator is usually controlled by a lever in the car; but as hotels increase in height and area the elevator service demands become more nearly approximately those of office buildings, with the result that consideration is given to use of automatic types of operation. With this automatic form of control, the operators merely press buttons in the car to indicate the floor stops and initiate the closing of the doors. These close automatically, the elevators start automatically, and then stop automatically at all floors for which buttons have been pressed, either in the car operating panel or by waiting passengers on the floors. This automatic operation, with its self-leveling feature, permits much higher car speed than could be obtained with manual control, 700 feet a minute being usual and 1,000 feet a minute quite possible.

Unattended Elevators. Through further application of these devices, increasing use is being made of unattended elevators, the operation of the control buttons being by the passengers themselves. In earlier construction, an elevator in motion would be unaffected by other signals, would-be passengers desirous of traveling in the same direction being obliged to wait for service until the trip had been completed. Control is now so arranged that the elevator responds to these intermediate signals, with a saving of time, of power, and of wear. The control can be so arranged that a car on being emptied will automatically take station either at the top or the bottom of the shaft. Thus when travel is downward, the elevator on completing a trip will return empty to the top floor, that the next call can be answered in minimum time, while for upward travel its station will be at the ground floor.

When the size of the building requires two elevators, their controls are so coördinated that during periods of light traffic only one will be in operation; but should this be in motion when there is a further call, the second will automatically come into service and continue in action until demands are within the capacity of one elevator.

Unattended Elevators for Hotels. While unattended elevators are of proved reliability, they are practicable only when their users become as familiar with them as will be the case in a small residential hotel. For hotels with any proportion of transient guests, operators will be needed.

Service Elevators. The requirements in service elevators will depend on the separation between kitchen and dining rooms, the need of restaurant service in guest rooms, and similar conditions. In type, speed and capacity these elevators should be the same as for passenger service, the only difference being in finish of cars.

Sidewalk Elevators and Hoists. When sidewalk elevators are necessary for handling baggage and supplies, they will be of the standard types that have long been perfected. For the discharge of ashes, however, special hoists have been devised with the object of delivering ashes directly to the truck and so avoiding the setting of ash cans on the sidewalk and the need for labor in their further handling. While elevators and hoists for these uses concern solely the management, their convenience and costs of operation will have an effect on the general business of the hotel, and they should not be installed without careful study and a full understanding of the requirements.

VACUUM CLEANING OF HOTELS

BY

A. LINCOLN SCOTT

ONE of the vital cost problems in hotel operation today concerns the tremendous cost of carpet replacements. Approximately 1,500,000 yards, or $4,000,000 worth, of carpet is used each year by the hotels of this country to replace worn out material, and the average depreciation of carpets in hotels is 25 per cent per year. In view of these facts, it is obvious that the architect, in planning a new hotel, must give considerable thought to the method to be used by the hotel for purposes of carpet cleaning, as the method of cleaning and the state of cleanliness are two of the most important items regulating the length of time that a carpet will last, second only to traffic and abuse.

Inquiry among architects and engineers shows a very decided lack of authentic data on carpet-cleaning methods and, due to this fact, many hotels are designed and built without adequate cleaning systems. This mistake costs hotels of the country fabulous amounts each year, due to having to operate with inadequate equipment and by inefficient methods. A great deal of attention is given to the item of plumbing because it is recognized that it is difficult and costly, when once a building is completed, to make changes in its basic structure. This should also hold true in selecting the vacuum system to be used, as it is impractical to install a satisfactory system once the building is finished.

There are three types of equipment for vacuum-cleaning carpets,—the portable cleaner; the semi-portable cleaner or truck type machine, and the central or installed plant. By the portable type is meant the very light-weight machine in which the cleaning nozzle is attached to and is part of the machine and where the dirt passes into a bag which is fastened to the handle. This equipment is commonly used in homes, although many hotels are endeavoring to use it due to the fact that they have no other equipment. The domestic type cleaner is satisfactory when applied to service for which the machines are designed. Such light apparatus is not adequate when confronted with an eight-hour duty six days per week throughout the year. The portable machine is obviously too light for hotel service, the cost of repairs, maintenance and replacements being large, and the cleaning generally unsatisfactory when applied to hotel usage.

The semi-portable machine is the heavier type which is mounted on a truck equipped with wheels. With this type the cleaning is done by a separate tool and with varying lengths of hose. With building costs at the present-day high level, naturally the architect is interested in eliminating as much expense as possible, and it is because of this fact that a truck type machine sometimes is selected for a new hotel. When new, and kept clean, properly oiled, and up to its best possible mechanical efficiency, this machine is capable of doing fair work in hotel carpet cleaning. Difficulties arise due to the great care that the machine requires and to the fact that it is generally operated by housemen receiving about $20 per week with no knowledge of mechanics. The truck type machine is used a long way from the central power system, and, naturally, multiplying the number of machines over the house is costly and multiplies the opportunities for their neglect and consequently poor cleaning and waste of carpets. The truck type machine is thus frequently costly to maintain and operate.

Central System. The only remaining type worthy of consideration is the "central" or installed plant. This system consists of a vacuum machine together with a dirt separator or separators located in the basement of the hotel and connected to a piping system which extends throughout the building with outlets so located as to permit cleaning men to reach all parts of the building with convenient lengths of hose and cleaning tools. The cleaning principle of all systems of this type is that of an inrush of air at high velocity into the tool, which is caused by the air exhauster in the basement, creating and maintaining a sufficient vacuum throughout the piping system. The cleaning is done by passing the cleaning tool forward and backward alternately over the surface. The central system is dependent for cleaning entirely on the maintenance of a proper vacuum at the tool end at all times and in every part of the building. Therefore, no matter how good may be the machine in the basement, its cleaning efficiency will depend entirely upon the piping system being installed of proper size, and the architect should be very particular in outlining the specifications in this respect.

The advantages to the hotel operator of the architect's specifying an adequate central system are many. In the first place, all the machinery in connection with the system is installed in the basement under the expert care of the engineer in charge, and the people doing the actual cleaning do not come in contact with it at all. Secondly, all the dirt is carried automatically to the basement where it can be disposed of expeditiously without the inconvenience of hauling it from the various

Special Tools Are Needed for Various Types of Cleaning

floors. In the third place, the foul air is discharged into a flue and out of the building. This is a decided advantage, inasmuch as a room can be cleaned and left in perfect condition after vacuuming without even the necessity of opening the windows and, most important of all, is better cleaned, more quickly cleaned, and more economically cleaned. Of course, architects are confronted continually with the naturally higher cost of installation of the central system, but the extra initial expense will certainly pay for itself many times over.

Central vacuum cleaning systems are designated in sizes as one-sweeper plants, two-sweeper, etc., showing number of cleaning tools that may be operated at one time with proper cleaning efficiency. In hotels of less than 125 rooms, an architect should specify a one-sweeper capacity plant. For larger hotels, having a sweeper for each 100 rooms is generally a satisfactory rule to follow for average requirements. This rule, however, may be modified to meet the needs of unusual circumstances.

There are several central systems being marketed at the present time, so this article will outline the most important items to be considered and covered, regardless of the make of apparatus. A central system may be divided into these important parts, and it will be necessary for the architect, in establishing his specifications, to give considerable thought to each of these items:

1. Vacuum producer,
2. Motor,
3. Separator,
4. Piping system,
5. Inlet valves,
6. Hose,
7. Cleaning tools.

Vacuum Producer. In considering the vacuum producer, the best type is the self-governing type, capable of operating simultaneously the required number of sweepers, and it should be constructed with clearances of not less than 1/8 inch throughout to avoid injurious wear from dust or dirt. Apparatus operated at a speed not to exceed 1800 r.p.m. is very much preferred, particularly for large hotels, and although somewhat more expensive at first cost, it is cheaper in the long run than higher speed equipment which naturally depreciates more rapidly and causes more trouble. To avoid excessive vacuum at outlets near the machine, or where less than the full number of sweepers are in use, the vacuum at the machine must at no time exceed 7 inches of mercury. No auxiliary governing devices of any kind whatsoever should be permitted. The bearings should be of the self-oiling type and should operate under maximum loads and speed without undue heating.

The motor should be mounted on or by the vacuum producer and directly connected thereto, and, if direct current is to be used, it should be of the commutating pole type with slotted commutator, preferably General Electric, Westinghouse, or whatever the architect considers equally as good The motor should be of ample size and

Proper Equipment Simplifies Such a Difficult Problem as Cleaning Under Beds with Minimum Effort be capable of running at full load for two hours without undue noise or vibration.

The separator or separators should be of the dry type and constructed of steel. They should be provided on the pipe lines in the basement at or near the vacuum producer and should be capable of separating 95 per cent of the dust. No cloth bags or other appliances liable to rupture by the air currents should be permitted in the separators, and construction should be such that no part will receive the direct impact of the dust.

The piping system should be such as to operate the required number of sweepers simultaneously and should be in accordance with the standard recommendations of the manufacturer of the equipment to be furnished. The piping should be of black mild steel or wrought iron, and all fittings should be of the long-turn recessed type except where it is impossible to get them into the available space, in which case, short-turn recessed fittings should be used. Use of steam, gas or water fittings should not be permitted. In cases where the piping is below the receiver and dirt must be drawn up, long-radius pipe bends (similar to electrical conduit) should be used instead of elbows. All pipes should be smooth inside and be reamed to full inside diameter, removing all burrs, or any other projections that would catch dirt, lint, or the like, and all pipe should be screwed "home" in the fittings so as to leave a smooth, uniform bore; all ends of pipe to butt where couplings are used. Easily accessible, horizontally disposed clean-out plugs should be placed at the bottoms of all risers, and at the end of every long horizontal run. The contractors should should be compelled to leave the face of the fitting back from the finished face of the wall or floor from ¾ inch to 1 inch. Failure to do this should entail on the piping contractor any extra expense involved in making this part of the work acceptable. Approved pipe hangers should be substantially installed and should be located as near together as 10 feet. Exposed pipes, where they pass through a finished floor or wall, should be provided with nickel-plated floor or ceiling plates. Exhaust pipe should be connected to a chimney or flue without other openings above the basement. The piping contractor should provide and permanently install, at a point as nearly as possible over the center of the machine, a ring or beam clamp of sufficient strength to lift the machine to be used in setting it up in case of its needing repairs.

All Dirt Accumulates in this Tank of the Central System of the Paramount Hotel, New York

Drapery is Effectively Cleaned by Using a Broad Brush Tool

The inlet valves should be 1½ inch, so located in the building that any point can be reached with not more than 50 feet of hose, as anything above this is cumbersome and inconvenient to handle. These valves should be of the spring closing type with concealed springs of best quality and of such strength as to insure closing of the valves in any position. Valves should not project more than ¾ inch from wall or baseboard.

The hose should be in 50-foot lengths, with a length for each sweeper that the plant is designed to operate. It should be 1½-inch steel reinforced suction hose to weigh not more than 14 ounces per foot. The hose should be equipped with clincher type rubber couplings with no metal exposed on either end to mar the floors, woodwork or furniture.

The cleaning tools should be of the best materials and workmanship with renewable wearing surfaces and with slots not less than ⅝ inch in width, and should be of the swivel type, controllable by the operator by turning the handle. All floor and wall handles should be of steel tubing, chromium-plated excepted those made of aluminum, which should be polished. All tools should be positively attached to handles, and under no circumstances should use of friction tape connections be permitted. Here is a list of cleaning tools which should be furnished for each sweeper that the plant is designed to operate:—

One floor handle with inside diameter not less than 1⅛ inch, equipped with elbow joint and shut-off valve.

One wall handle in two sections not less than 1⅛ inch inside diameter.

One 5-inch hand tool for upholstery.

One 12-inch carpet renovator with not less than 7½ square inches area of slot.

One 15-inch open end bare floor tool with replaceable rubber composition, or felt sides with not less than 8 square inches slot area.

One 8-inch hand brush and library tool.

One 4-inch round brush.

One 15-inch wall brush.

I have endeavored to give, in discussing the various parts of a central plant, sufficient information to enable an architect to draw specifications suitable for all types of buildings. There is nothing contained herein that will abolish fair competition or make for excessive price.

After a survey of all of the first class hotels in New York, it was found that these houses, which are noted for their cleanliness and service, contain central installed vacuum cleaners, which come within the range of the standards herein outlined: — Paramount, Plaza, Savoy-Plaza, Sherry - Netherland, Biltmore, Commodore, McAlpin, Pennsylvania, Roosevelt, Ambassador, Ritz-Carlton.

Test. The architect, in drawing specifications for a central installed vacuum system, should insist that a test be conducted on the system, upon completion, known as the "orifice test." The vacuum producer must maintain a substantially constant vacuum under all working conditions and be capable of maintaining for each sweeper at the end of 50 feet of hose, not over 1½ inches in diameter, attached to any inlet valve in the building, a vacuum of not less than 2 inches of mercury while a round sharp-edged orifice ⅞ inch in diameter is wide open and a vacuum of not less than 3 inches of mercury while a round sharp-edged orifice ⅝ inch in diameter is open.

To determine if the apparatus meets the test described, one outlet for each sweeper that the apparatus is to operate simultaneously should be selected by the engineer making the test, to each of which should be attached 50 feet of hose of the size used with the system. In all of these hose, except one, should be placed a plate ⅛ inch thick with a ⅞-inch round, sharp-edged orifice through it. In the end of the hose where the test is to be made, there should be placed a hollow metal globe substantially 4 inches inside diameter, to the top of which should be attached a vacuum gauge and in the side of which should be a ⅞-inch round, sharp-edged orifice. The vacuum gauge under these conditions must show not less than 2 inches of mercury. A similar test should be made using ⅝-inch orifice instead of ⅞-inch orifice, under which condition the vacuum gauge must not show less than 3 inches of mercury.

Contrary to impressions prevailing in some quarters, central cleaning systems are available and may be installed in the smaller and moderate sized hotels, as well as in larger structures. In many hotels of 100 rooms or even less, one finds the same efficient equipment that is found in the high class hotels of as many or even more than 1000 rooms. A centrally installed vacuum system is of great value in cleaning marble corridors, ball rooms, etc., and is also a great help in caring for upholstered furniture, as well as mattresses and pillows. Many hotels that I have been connected with have had special rooms where the chairs, mattresses, pillows and hangings were vacuumed at regular intervals.

As an engineer and a hotel manager, it is my personal opinion that a good, reliable and properly installed vacuum system is one of the most important and necessary features of any hotel.

HOTEL LAUNDRIES

BY

CLIFFORD WAYNE SPENCER

IN allotting space and equipment to the various departments of hotels it has too often been the custom to relegate the laundry to the background and force the laundry engineers to accommodate their layouts to whatever space happens to be left over, often greatly impairing the efficient operation of the laundry service. It should be quite evident that there is hardly a detail of hotel service that can react so decisively to the advantage or disadvantage of a hotel's reputation as the supply of clean linen. Hotel laundry does not require as much washing as general laundry, since it is usually only slightly soiled. The management of the hotel, by keeping direct supervision, is able to bring about an increase in the life of linen. Added to this saving there is the fact that it has been found very profitable to do guests' work.

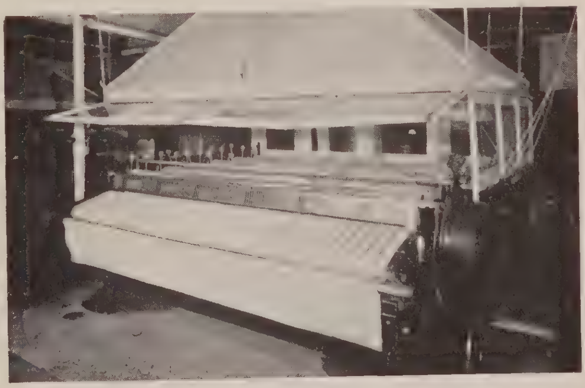
Space. The amount of space to be devoted to laundry purposes depends on the location of the hotel and the amount of service to be rendered. A hotel in a small town is not likely to have as many pieces of laundry per room as would a large city hotel, due to the facts that their dining room service is usually less; that they seldom have to provide for banquets; and that they usually do not have to provide linen for barber shops or beauty parlors. Inquiry should always be made as to just which of these departments is to be served with clean linen, and whether the personal work of guests is to be done by the hotel. The space may be estimated in a general way on the basis of so many square feet per room. Large city hotels supplying complete service launder about 30 pieces for each room and require from 7 to 10 square feet per room, while in smaller hotels about 15 or 20 pieces may be expected from each room, requiring a floor area in the laundry of from 5 to 8 square feet. In these small hotels where guest work is not done, the number of pieces from each room may only be 8 or 12, and in such cases the floor area of the laundry might be reduced to from 4 to 6 square feet for each room. A good general rule for allotting space on the basis of the number of beds is 10 square feet per bed, but this should always be governed by a careful study of the conditions in each case, to see whether they warrant a reduction in the ratio of laundry space to the number of beds. If it is possible to arrange the various machines in such a way that the wash is fed from one to the other by gravity, a great saving may be effected by eliminating the space that would otherwise be devoted to the storage and movement of a large number of trucks. In a recently completed hotel of about 2300 rooms, the laundry, which is arranged to operate by gravity, has a total of 42,500 square feet of floor space distributed in this way:

Hotel work division	17,800 sq. ft.
Guests' " "	7,250 " "
Receiving and shipping	2,600 " "
Boilers, engine, softener, tanks, etc.	5,000 " "
Storage, employes' washrooms, offices, stairways, elevators, etc..	9,850 " "

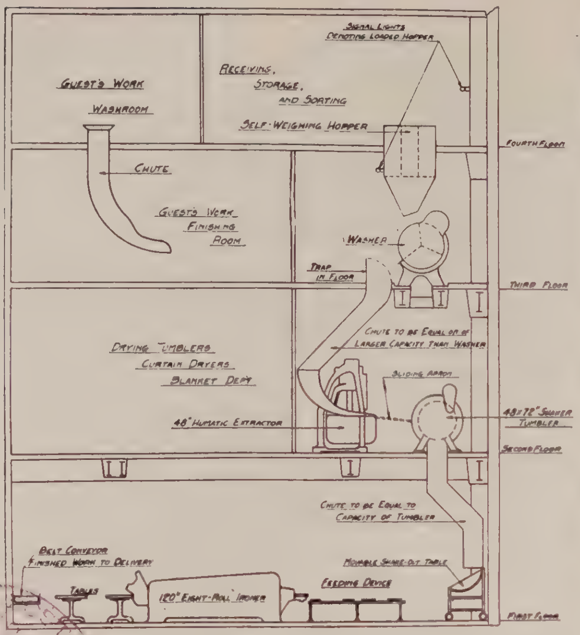
It should be pointed out, however, that this laundry is in the form of a separate unit located in an outlying district where saving of space is not so vital, and that garage space and employes' restaurant are included.

Location. The attempt to make every possible square inch of hotel space available to the entertaining of guests has usually resulted in the laundries being located in the basement, which although not ideal from the point of view of the laundry itself, is bearable providing ample ventilation and artificial lighting are secured. This also

Finishing Department for Hotel Guests' Laundry



Flat Work Ironer in a Large Hotel



LIBRARY

Diagram Showing Machines Arranged in Vertical Sequence

Extractors Should Be Securely Anchored to the Floor

has the advantage of placing the laundry near the power and heat of the hotel engine room. In some houses, such as the Lord Baltimore Hotel, in Baltimore, where the laundry is placed on the 18th floor, it has been thought advisable to locate the laundry near the top of the building, permitting a considerable saving in the cost of lighting and ventilating equipment. This is partly offset, however, by the additional cost of structural members to bear the heavy machinery and of risers to bring steam and hot water from the boiler room, to say nothing of the loss of space that might otherwise be available for guests' rooms. In the case of some large hotels located in districts where the value of real estate is enormous, it has been found worth while to locate the laundry in a separate building at some distance from the hotel, transporting the clean and soiled linen in huge baskets loaded on motor trucks. A good example of this is at the new Palmer House, in Chicago, where the laundry is located in a modern four-story building, some four miles from the hotel itself. Perhaps an ideal location for a hotel laundry would be in a three- or four-story wing of the hotel proper where the linen could be received and sorted at the top and pass to the various machines by means of the gravity system.

Layout. The up-to-date hotel laundry is so laid out that the soiled linen is collected from the guest rooms, sorted, washed, dried, finished and returned to the rooms with a minimum of labor, noise and confusion, the various processes taking place in direct sequence with as little crisscrossing as possible. In a hotel where the laundry is located on a lower floor, which is the usual arrangement, the linen is collected from the rooms in trucks and placed in laundry chutes which are usually constructed of metal, sometimes lined with glass, being perfectly smooth and having airtight doors at each floor. Being airtight, the fall of the soiled linen is air-cushioned, and it arrives at the sorting room without impact. The sorting room should be just above the washroom, if possible, and in close proximity to the laundry office where the lists are checked and charged. It is then delivered to the washroom and placed in the washers, whence it is passed to the extractors and thence to the tumblers, and finally to the various finishing departments. In the case of the flat work, such as sheets and pillow cases, they are put directly through the flat work ironers and delivered to the master linen room whence they are taken to linen closets on the various floors as needed. In some cases flat work is taken directly to the linen closets. Bath towels and curtains, after leaving the tumblers, go to special drying tumblers, and the curtains are then placed on stretcher dryers. The guests' personal work may pass through the same washers and extractors as the house work, but it is far more desirable to keep this class of work entirely separate if space and equipment permit. After leaving the extractors, this work is taken to the starch room or department where there is a large variety of starching equipment, collar equipment, shirt-finishing systems, prim presses and other finishing machines. Space must also be provided as near as possible to the guest work finishing department for sorting and packing, so that the work may be returned promptly to the rooms. By maintaining these guest work laundries, many hotels are able to collect work before 9 A.M. and return it the same day.

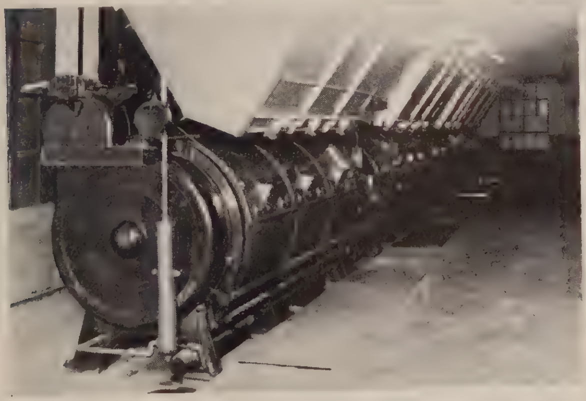
In addition to the office space, rest rooms and toilets for employes should be provided. These are often omitted, and the result is great inconvenience not only to the employes but to the hotel management as well. The boilers and general generators for the laundry may be separate or included in the general power unit of the hotel, and the water supply should be assured at all times. Usually it is impossible to pipe water directly from city lines, as the pressure is too low. In such cases, pumps and storage tanks should be supplied. It is the practice in modern laundries to heat water by using exhaust steam and by reclaiming heat from waste water. Equipment for all these purposes should be provided for. As already said, a considerable saving in space and labor can be made if it is possible to locate machinery in vertical sequence, so that the wash moves downward from one machine to another by force of gravity. If this is done, the soiled material is sorted into hoppers at the top and allowed to drop into the washers on the floor below. Then it drops through the floor to extractors and tumblers on the next floor, and from there drops to the shake-out tables whence it is fed through the ironers. By this method, practically all the manual labor is eliminated from the washing process. Space above the machines is utilized for storage, and a large number of push trucks, which require a considerable amount of space for storage and movement, are eliminated.

Special Features. Since absolute cleanliness is the most important factor in laundry work, the walls and floor should be smooth and easily washed with as few exposed pipes as possible. Gutters should be supplied in the wash room, and if the gravity system is to be used, proper floor openings should be provided. If natural light is available, it should be admitted freely through an abundance of windows and skylights, if possible, as the lighting of laundries should be unusually good in order that work may be inspected and details brought out clearly. Artificial light should also be provided, and in the case of basement laundries it should be carefully planned with due attention to these requirements:

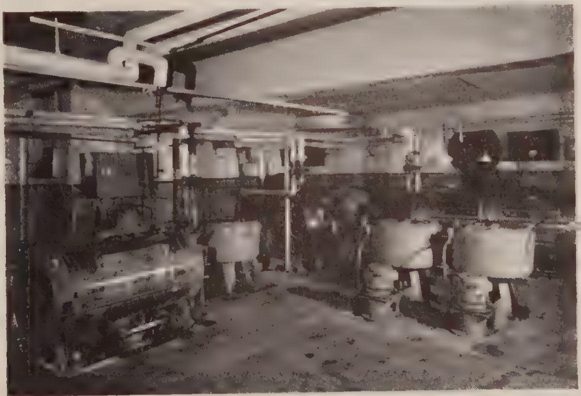
1. A steady light of sufficient intensity on all working surfaces.
2. A light of comparable intensity on adjoining areas and walls.
3. Light of color and spectral character best suited to its purpose.
4. Freedom from glare and glaring reflections.
5. Light so directed and diffused as to prevent shadows or contrasts of intensity.
6. System to be simple and economical.

For the purpose of lighting laundries mercury vapor lights are considered by some to be even more satisfactory than sunlight, since it is easier on the eyes; does not produce a glare; and exaggerates imperfections. Another important factor in the efficient operation of a laundry is good ventilation. If the laundry is on an upper floor, this is comparatively simple. When the laundry is in the basement the equipment must be more complete. In any case, the air should be warmed to the room temperature before being admitted so as not to cause fog and condensation on the walls. In addition to the general ventilation system, hoods with exhaust fans should be provided over heated machines. Where the laundry is on a lower floor, the exhaust should not be in close proximity to the guest quarters.

Unless an architect is entirely familiar with the most up-to-date types of laundry machinery he should not attempt to write specifications for this type of equipment without calling in a laundry specialist, since this type is subject to such rapid improvement that a specification good a year or two ago may a little later be entirely out of date.



Washers with Hoppers and Trap Doors for Easy Loading and Emptying



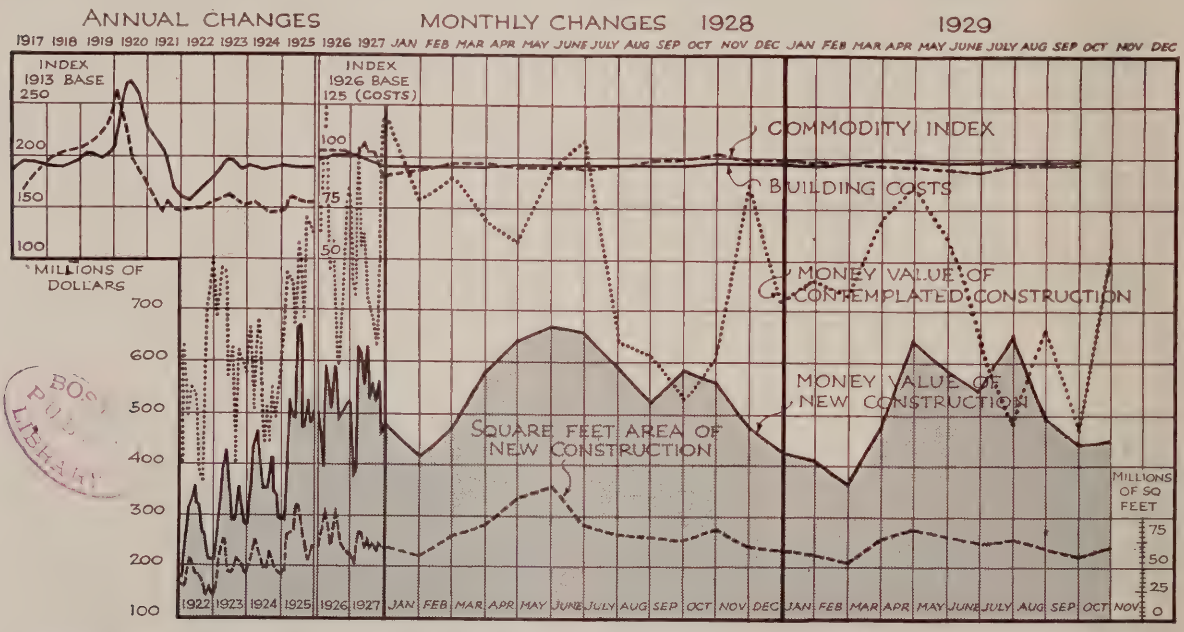
Extractors and Washers Should Be in Close Proximity for Efficient Operation

THE BUILDING SITUATION

A MONTHLY REVIEW OF COSTS AND CONDITIONS

BUILDING construction contracts awarded during the month of October amounted to $445,642,300, according to reports of the F. W. Dodge Corporation, covering the 37 states east of the Rocky Mountains. This exceeds by $240,000 the value of contracts awarded during the previous month, but is 25 per cent lower than the figure for October of last year. The total for the first ten months of 1929, amounting to $5,046,909,900 shows a falling off of 12 per cent when compared with the total for the corresponding period of 1928. The district which includes New York and northern New Jersey, with contracts valued at $101,603,100 reported during October, shows an improvement of 25 per cent when compared with September, but a great falling off, amounting to 46 per cent, when compared with October, 1928. For the first ten months of 1929 this district shows a total of $1,184,737,300, which is 23 per cent below that for the corresponding portion of 1928. The New England states, with an October total of $40,040,700 showed an improvement of 17 per cent over September, but fell off 3 per cent from October, 1928. For the first ten months of 1929, with a total of $358,288,500, New England is 18 per cent behind its figure for the same period of 1928.

The middle Atlantic states represent another district in which the October figures are ahead of September but below the total for the previous October. The October total of $51,531,500 was 6 per cent ahead of September but 34 per cent below October. For the ten months to date, this district total was $608,747,400, showing a decrease of 11 per cent when compared with the ten months of 1928. An optimistic trend seems apparent in the Pittsburgh district. The contracts awarded during the month of October amounted to $77,619,300. The contract figures reported during October do not indicate any radical changes in the trend of construction indicated by figures of previous months of this year. It is important to note, however, that October reports of work in contemplation for future months show an increase of 73 per cent over similar reports obtained during September and of 30 per cent over contemplated work reported during October of 1928. This contemplated work may not materialize in time to swell the total for 1929, but coupled with the easier money situation, it argues well for more extensive construction activity during the early part of 1930.



THESE various important factors of change in the building situation are recorded in the chart given here: (1) *Building Costs.* This includes the cost of labor and materials; the index point is a composite of all available reports in basic materials and labor costs under national averages. (2) *Commodity Index.* Index figure determined by the United States Department of Labor. (3) *Money Value of Contemplated Construction.* Values of building for which plans have been filed based on reports of the United States Chamber of Commerce, F. W. Dodge Corp. and *Engineering News-Record.* (4) *Money Value of New Construction.* Total valuation of all contracts actually let. The dollar scale is at the left of the chart in millions. (5) *Square Foot Area of New Construction.* The measured volume of new buildings. The square foot measure is at the right of the chart. The variation of distances between the value and volume lines represents a square foot cost which is determined, first by the trend of building costs, and second, by the quality of construction.

Tasting doesn't tell

Tasting the water doesn't tell anything about its corrosiveness . . . Waters that are purest and most healthful may be highly corrosive.

WATERS may taste and look alike but, at the same time, depending upon their sources and treatment, may vary greatly in their effects on plumbing pipe. Purity, from a health standpoint, has no relation to corrosiveness.

In writing plumbing pipe specifications, therefore, the character of the local water supply should be carefully considered. Brass Pipe will outlast rustable pipe under all conditions, but not all alloys of brass will give the same satisfactory service everywhere.

To meet different water conditions, The American Brass Company has developed two alloys of Anaconda Brass Pipe, Anaconda 85 and Anaconda 67.

Anaconda 67 Brass Pipe—Where normal water conditions prevail; that is when waters are *not* drawn from peaty sources, shallow wells, tubular wells or filter galleries in lowlands along river beds and where filtered waters are not of high permanent hardness, Anaconda 67 Brass Pipe is recommended. This pipe contains not less than 67% copper; is seamless, semi-annealed and guaranteed.

Anaconda 85 Red-Brass Pipe—For distribution lines carrying ground waters and colored surface waters, particularly when drawn from peaty sources and filtered waters which may be high in carbonic acid content and low in alkalinity, Anaconda 85 Red-Brass Pipe is offered as the best corrosion-resisting pipe commercially obtainable. This pipe, containing a minimum of 85% copper, is seamless, semi-annealed and guaranteed.

Proved by 16 years of testing

The durability of these two kinds of pipe has been proven by 16 years of exhaustive research during which many copper-zinc pipe alloys were subjected to the action of unusually corrosive water for a period of ten years. Six years' field investigation of actual installations substantiated the laboratory tests and resulted in the adoption of the alloys now known as Anaconda 67 and Anaconda 85.

Service to Architects

The Technical Department of The American Brass Company is prepared to help determine the character of local water supplies. Architects are invited to make use of this service. The American Brass Company; General Offices: Waterbury, Connecticut.

ANACONDA BRASS PIPE

FOR HOT AND COLD WATER LINES

This is the "K of K Hygienic" Seat *made by Kohler of Kohler*

HERE is the latest addition to the Kohler line. A very important addition—"K of K Hygienic" closet seats. A complete line—all models—open and closed front, with and without covers, in Sea Pearl finish or plain, harmonizing with all Kohler colors, also in white, black, mahogany, and golden oak.

With many new features to recommend it, perhaps the outstanding feature of this new line is Kohler *Quality*. "K of K Hygienic" seats are made *by* Kohler *at* Kohler, insuring the same quality standard, centralized control, fine workmanship, and rigid inspection that have built the reputation of Kohler Enameled Iron fixtures, Vitreous China, and Brass.

You may now specify Kohler closets complete with Kohler seats, crated together—thus centralizing responsibility for quality and delivery, while simplifying specification-writing, ordering, and handling "on the job."

Improved Design—New Features Kohler Quality

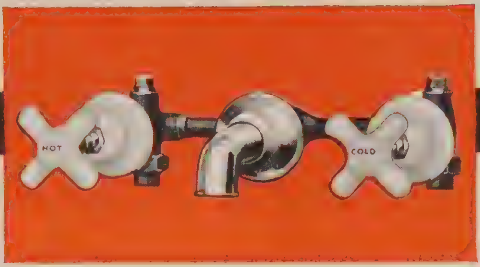
1. Cover and seat swing from one concealed bar hinge.
2. Flange on hinge checks seat and cover in upright position.
3. Two metal bars keep cover securely in place.
4. Solid hardwood core, reinforced with cross-grain dowels.
5. Durable, sanitary sheet covering.

KOHLER CO., *Founded 1873,* Kohler, Wis. · *Shipping Point,* Sheboygan, Wis. · *Branches in Principal Cities*

KOHLER OF KOHLER

PLUMBING FIXTURES

LOOK FOR THE KOHLER TRADE MARK ON EACH FIXTURE



Strengthen the "vital spots"!

Specify Mueller faucets and fittings

MODERN architects know that dependable water service is imperative in every building that they design. Thousands of these men have learned that the "vital spots" of a water system—faucets and fittings—can be relied upon to give year-after-year service if "MUELLER" is written into the specifications.

Mueller Faucets and Fittings are built of the finest obtainable materials by an organization which for 72 years has manufactured these products to the highest standards of quality. Rigid laboratory control and the skilled workmanship of master craftsmen are not regarded as a sufficient guaranty of Mueller Quality. As an added precaution, Mueller products are tested under conditions which are many times more severe than those encountered in actual service.

Mueller dependability may be enjoyed without sacrifice of appearance, for selections can be made from a wide variety of beautiful and richly finished Mueller designs. Ask your master plumber about Mueller Faucets and Fittings or write to us for interesting information.

MUELLER CO. (Established 1857), Decatur, Illinois. *Branches*: New York, 135th St. and Walnut Ave., Bronx; Dallas, San Francisco, Los Angeles. *Canadian Factory:* MUELLER, Limited, Sarnia.

Mueller Built-In Equipment
offers important advantages in simplicity of design and easy accessibility.

Mueller G-4050
Over-Rim Tub Filler. Overhead shower may be connected.

Mueller G-5865
Pop-Up Drain. No panel necessary behind tub. All parts removable from inside of tub.

MUELLER

PLUMBING BRONZE AND VITREOUS WARE

REPUBLIC PIPE DISTRIBUTES *the* HEAT IN THIS GREAT BUILDING

An extensive, hidden maze of Republic Pipe, a tubular structure in itself—carries the heat to every corner of this monumental building. A built-in system of steel pipes that are essential to the comfort of practically a small town of humans who daily people the structure.

Dependability and durability were the pipe demands—Republic was used.

Heating Contractors—Raisler Heating Co., N. Y. C.

International Telephone Building
New York City
BUCHMAN & KAHN • *Architects*

PRODUCTS
Pig Iron
Semi-finished Steel
Bars and Shapes
Hot and Cold Rolled Strip
Skelp
Black, Blue, Annealed, Galvanized and Long Terne Sheets
Coke Tin Plate—Tin Mill Black Plate
Black and Galvanized Standard Pipe
Oil Country Tubular Goods
Bolts, Nuts, Spikes, etc.

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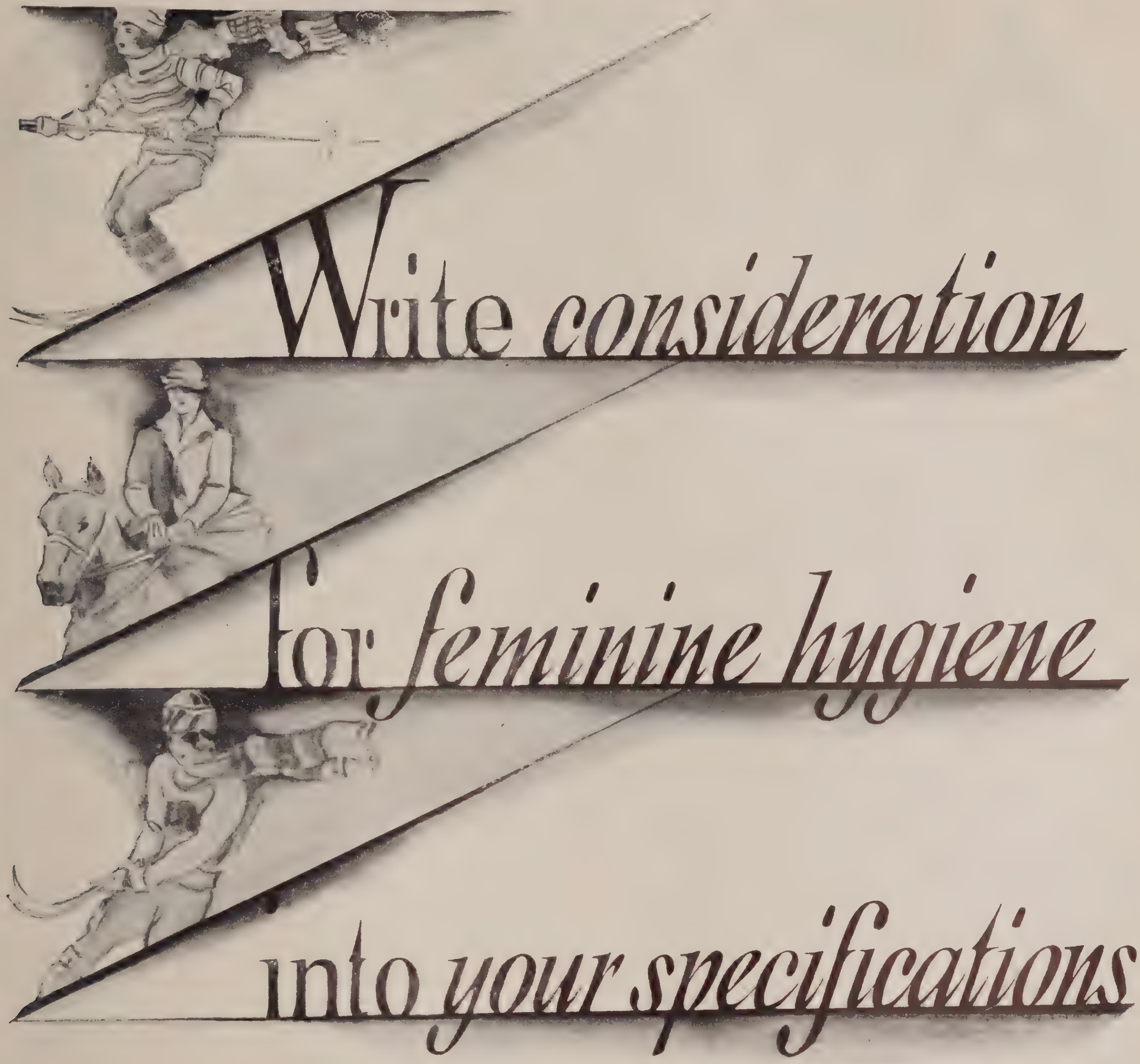
REPUBLIC
IRON & STEEL CO. YOUNGSTOWN O.
STEEL PIPE



WITHIN the last few years false modesty has given way to a new frankness regarding women's hygienic problems.

The need of the modern fastidious woman for adequate sanitation in her home or office is one which demands the serious consideration of every practicing architect.

The trapway of the average toilet is so small as to scarcely permit the passage of a golf ball. Such a toilet, when used for the disposal of sanitary pads, eventually clogs, stops up and causes repeated annoyance and embarrassment.

But there is one fine modern toilet particularly designed to meet this difficult problem. It is The Improved Madera, with large oversize trapway and powerful, yet silent, twin-jet siphonic flushing. The Madera passes sanitary pads easily and safely.

In addition to this thoroughly important feature, the Madera has a generous elongated bowl of glass-hard Durock, long and soil-proof seat with large opening, with all surfaces below the seat opening completely covered with water. Include it in your next specifications.

* * *

Thomas Maddock's Sons Pottery, Division of Standard Sanitary Manufacturing Company, Trenton, N. J.

ARMCO INGOT IRON

ventilating ducts in new Koppers Building

THE majestic new Koppers building, in Pittsburgh, was built to endure. So it was but fitting that rust-resisting ARMCO Ingot Iron be chosen for the ventilating ducts.

By the use of this pure iron, the expense and annoyance of frequent repairs and replacements will be avoided.

ARMCO Ingot Iron was selected because of its proved durability—the *longest record of actual service* of any low-cost, rust-resisting sheet metal.

Perhaps out of our wide experience we can help you with some sheet metal problem that's confronting you now. The office nearest you will be glad to assist. Write or telephone.

Back of this familiar symbol is nearly thirty years' experience in the manufacture of special analysis iron and steel sheets and plates. When you want a rust-resisting, low-cost metal be sure to see this triangle and the words "ARMCO Ingot Iron." It is assurance of dependable, economical service.

ARMCO

THE AMERICAN ROLLING MILL COMPANY

Executive Offices, Middletown, Ohio

Export: The ARMCO International Corporation

DISTRICT OFFICES:
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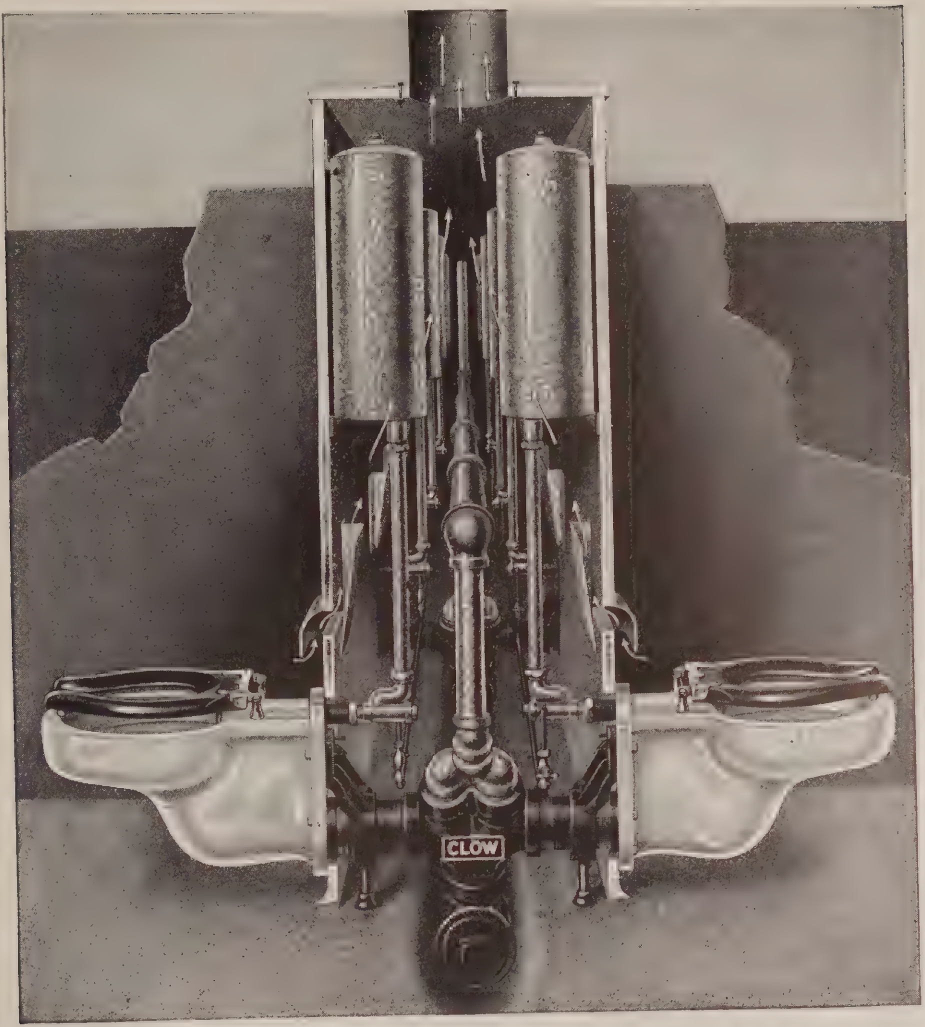


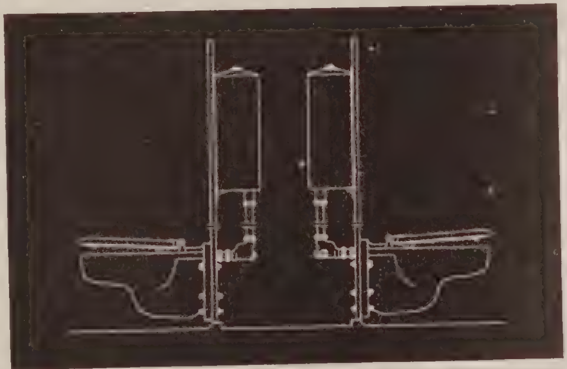
AUTOMATICALLY FRESH AND CLEAN

with Clow Madden Wallomatics . . . and Clow Patented Ventilators

Above is shown the application of the Clow Patented Closet Stall Ventilator. Through it, odors are drawn from the toilet room into the utility corridor—and carried off, at the outlet. It is so constructed that paper cannot be stuffed in to stop its action.

Automatically, closet rooms are fresh and clean.

And, independently of forgetful minds—Clow Madden Wallomatics send a powerful stream of water, cleansing the entire bowl after every use. There's nothing to touch. Nothing to remember. It's automatic.



RECORD NO. 107
26 years ago, 15 Clow Madden Automatics were installed at the May Street School, Benton Harbor, Michigan. In the past 6 years not one cent has been spent for repairs. No record was kept for previous years.

With Clow Madden Automatics, sanitation is assured for a quarter century and more—as installation records show.

For the Clow Madden Valve has only two moving parts—has no minute by-passes to cause trouble. Tests prove it uses less than half the usual amount of water, *for a surer flush.*

With Clow Patented Ventilators and Clow Madden Wallomatics, odor-free air and taint-free closets are automatically assured for the life of the building.

(Center Illustration)
Showing how closed top tanks are concealed in utility corridor behind back wall. Clow Wallomatics are built free of the floor for cleaner toilet rooms.

JAMES B. CLOW & SONS, 201-299 NORTH TALMAN AVE., CHICAGO

CLOW MADDEN AUTOMATIC

Forty-Eight Styles, Heights and Types to Meet Your Requirements

An Important Part of the Building Picture

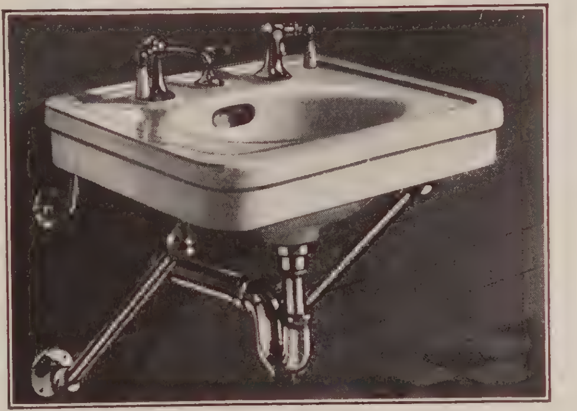
NATIONAL PIPE

NATIONAL TUBE COMPANY, PITTSBURGH, PA.
Subsidiary of United States Steel Corporation

© FAIRCHILD AERIAL SERVEYS INC

Entrance to Williamsburgh Savings Bank Bldg., Ashland and Hanson Places, Brooklyn, New York. HALSEY, McCORMICK & HELMER, INC., architects; ALEXANDER BRYANT CO., plumbing contractors; Solid Nickel Silver plumbing fixtures in Bank offices by MEYER-SNIFFEN CO., New York.*

WILLIAMSBURGH SAVINGS BANK
SOLID NICKEL SILVER* PLUMBING FIXTURES BY MEYER-SNIFFEN



THE Williamsburgh Savings Bank is another leading financial institution that insures the beauty and permanence of plumbing fixtures by using Solid Nickel Silver. Plumbing fixtures of Solid Nickel Silver were specified for these beautiful bank offices because this type of sanitary equipment retains its lustrous, clean-looking appearance in spite of severe service. In their silver-like appearance, fixtures of Solid Nickel Silver are comparable to Pure Nickel and to alloys of high Nickel content. They are corrosion-resisting and easy to keep bright...not easily marred or broken during installation or use. In hardness, toughness and strength they are similar to tough bronze and provide unusual wear-resistance, particularly at the valve seats. For quality plumbing installations, both large and small, the highest architectural opinion agrees that there is no substitute for Solid Nickel Silver.

18%22 Nickel SILVER

[*Diamond Metal is the name used by the MEYER-SNIFFEN CO. to identify its Nickel alloy used in manufacturing Nickel Silver plumbing fixtures. This is a solid white metal and contains a high percentage of Nickel.]

INCO NICKEL THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL STREET, NEW YORK, N. Y. INCO NICKEL

"Flush-Kleen"

SEWAGE EJECTORS

In The HOTEL

Schroeder Hotel—Milwaukee
. . . uses Duplex "Flush-Kleen" Sewage Ejectors
Architect—Holabird & Root, Chicago
Plumbing Contractor—Wenzel & Henoch, Milwaukee

HOTELS—such as the Schroeder, in Milwaukee—are using the "Flush-Kleen" Sewage Ejector to good advantage.

Public facilities receiving most use, and abuse, must be capable and sturdy.

"Flush-Kleen" will handle anything that can pass through sanitary return lines.

No strainer baskets to be cleaned—an obnoxious job often disregarded and which indirectly is the cause of much trouble in the basket type installation.

"Flush-Kleen"

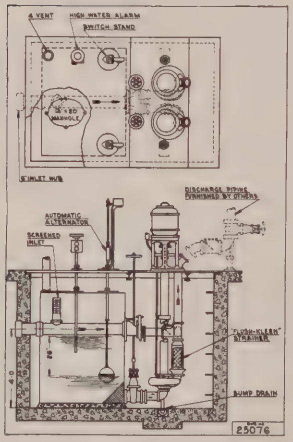


Fig. 2057—*Diagram of Duplex Dry Basin Flush-Kleen Sewage Ejectors.*

has been developed by "Chicago Pump" engineers who have had over 20 years' experience in pump design, and is recommended and guaranteed for hotel use.

Without the slightest hesitancy, engineers who have had "Flush-Kleen" experience, run most any kind of waste into their ejector pits.

"Flush-Kleen" employs the flow reversal principle—just like backwashing a filter.

Layouts, engineering data, specifications on several types of "Flush-Kleen" Ejectors to meet various conditions are available to you in Bulletin No. 125.

. . . will handle

1—Returns from basement toilets.
2—Refuse from kitchens.
3—Drainage from laundries, barber shops, etc.
4—Seepage and sub-drainage.
5—Anything that enters the basin . . . you cannot clog a "Flush-Kleen."

. . . features

a—No strainer baskets to be cleaned.
b—No sewage touches the impellers—they cannot bind or clog.
c—Basins do not become foul and unsanitary.
d—Operation of pumps alternated by the "Automatic Alternator."

CHICAGO PUMP COMPANY

SEWAGE-CONDENSATION-CIRCULATING
BILGE-FIRE-HOUSE-VACUUM

General Offices and Plant—2336 *Wolfram St., Chicago*
New York Office—79 Madison Ave.
Detroit Office—General Motors Bldg.

THERE IS NO SUBSTITUTE *for*

COHOES

Old Fashioned puddled Genuine wrought iron pipe

Facts are based upon experience—upon what *has* been done. Cohoes Pipe has *demonstrated* in 75 years of every conceivable use that it resists corrosion and rust and is leak-proof. The Cohoes old fashioned puddling mills turn out a quality of Genuine Wrought Iron that is impervious to time and the elements.

Our hand book of "Pipe Facts" contains authoritative information of sizes, weights and uses. Send for it.

COHOES ROLLING MILL CO.
COHOES, NEW YORK
Branches: NEW YORK - CHICAGO - LOS ANGELES - SEATTLE - PORTLAND
BOSTON - CLEVELAND - DETROIT - NORFOLK - MINNEAPOLIS

PUT Reading Genuine Puddled Wrought Iron Pipe into your buildings. As far as you are concerned, the wrench that tightens the joints is the last wrench they need ever know. For far beyond the span of human life, these sturdy pipes will resist corrosion, strain, and vibration. But if the building be torn down, other wrenches may take these pipes apart only to reinstall them elsewhere!

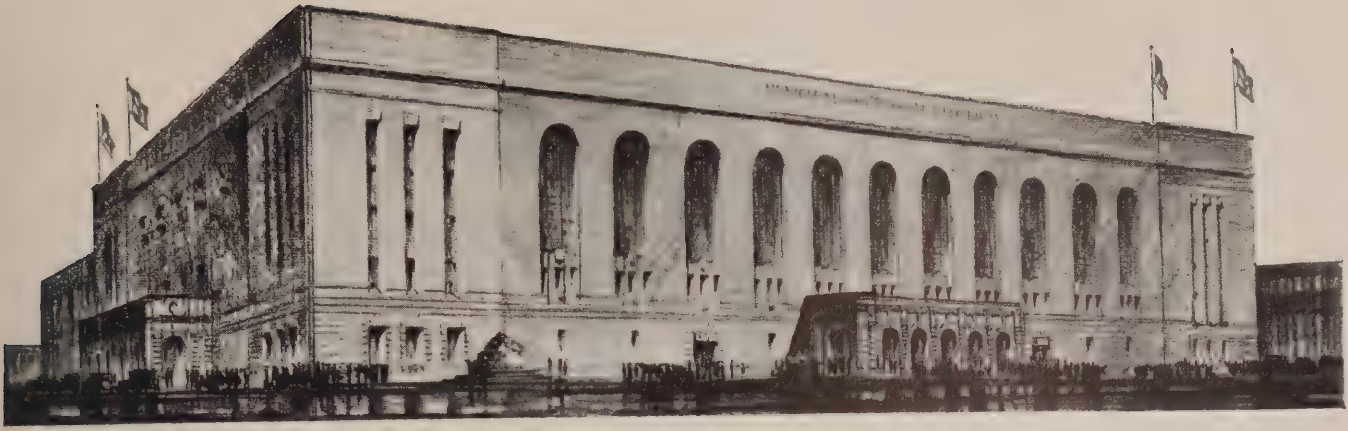
Be sure you get pipe with the Reading name, date of manufacture, and cut-in spiral knurl mark on it.

READING IRON COMPANY, Reading, Pennsylvania

Atlanta · Baltimore · Cleveland · New York · Philadelphia
Boston · Cincinnati · St. Louis · Chicago · New Orleans
Buffalo · Houston · Tulsa · Seattle · San Francisco
Detroit · Pittsburgh · Ft. Worth · Los Angeles · Kansas City

GENUINE PUDDLED WROUGHT IRON
READING PIPE
DIAMETERS RANGING FROM 1/8 TO 20 INCHES

DEFIES VIBRATION · RESISTS CORROSION · HOLDS COATINGS · THREADS EASILY · WELDS BETTER
POINT 5 PIPE
READING
GENUINE PUDDLED WROUGHT IRON



MUNICIPAL AUDITORIUM, NEW ORLEANS, LA.

Favrot & Livaudais, New Orleans, Architects. Equipped with DOUGLAS Plumbing Fixtures trimmed with Solid Nickel Silver.
A. G. Rose, Inc., New Orleans, Plumbers.

Again . . . The Architect's Choice

DOUGLAS Solid Nickel Silver self-closing faucet with drop ear indexed handles.

DOUGLAS

PLUMBING FIXTURES

trimmed with Solid Nickel Silver

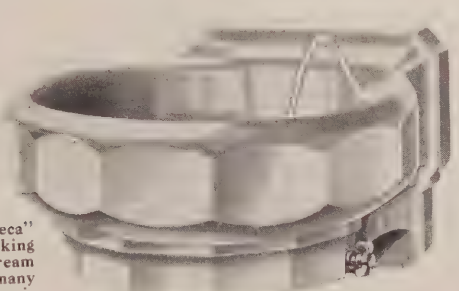
Consistent with their well-established policy of carefully selecting materials and workmanship, Favrot & Livaudais, Architects, of New Orleans, specified DOUGLAS Plumbing Fixtures equipped with Solid Nickel Silver Fittings for the handsome new Municipal Auditorium at New Orleans.

Fittings of this type are recognized to meet the highest architectural standards of quality. Long usage has proven their ability to remain everlastingly beautiful.

In comparing Solid Nickel Silver with plated fittings, they should be considered in the same light as when comparing any other solid metal with plated ware.

SOLID
18%/22 Nickel
SILVER

Solid Nickel Silver is nickel color through and through. It's rich lustre is equalled only by the mellow beauty of fine old silver. There is no plating to wear off or chip — it never rusts—resists corrosion—easily cleaned — as hard as bronze. Due to its toughness, valve seats are highly wear resistant.



DOUGLAS "Seneca" vitreous china drinking fountain with side stream —one of the many DOUGLAS super-sanitary plumbing fixtures.

The JOHN DOUGLAS COMPANY, Cincinnati, Ohio

Manufacturers of High-grade Plumbing Fixtures Since 1887

Great-grandfather

Paul Revere

founded this business

THE PIONEER OF THE COPPER INDUSTRY

History dramatizes Paul Revere as a daring, horseback patriot, who in spare time wrought exquisite silver bowls. In Canton, Mass., are relics of a lesser known Paul Revere, pioneer in copper rolling, founder of a great American industry.

Here in 1801, Paul Revere built America's first copper-rolling mill and rolled America's first copper sheet. His original Revere & Son (later Revere Copper Co.) was handed down to son, grandson, great-grandson.

⁂

A FAR-REACHING CONSOLIDATION

Last year came an important consolidation in American industry. Six successful companies joined as one . . . Baltimore Copper Mills, Dallas Brass & Copper Co., Higgins Brass & Manufacturing Co., Michigan Copper & Brass Co., Rome Brass & Copper Co., Taunton-New Bedford Copper Co. Their six plants high-spot the entire industrial area from Boston to Baltimore to Chicago. Their six units, with their specialties, combine to make a complete service in copper, brass and bronze. A natural consolidation!

In the Taunton-New Bedford unit, of which Edward H. R. Revere is Chairman, was the original Revere Copper Company founded in 1801.

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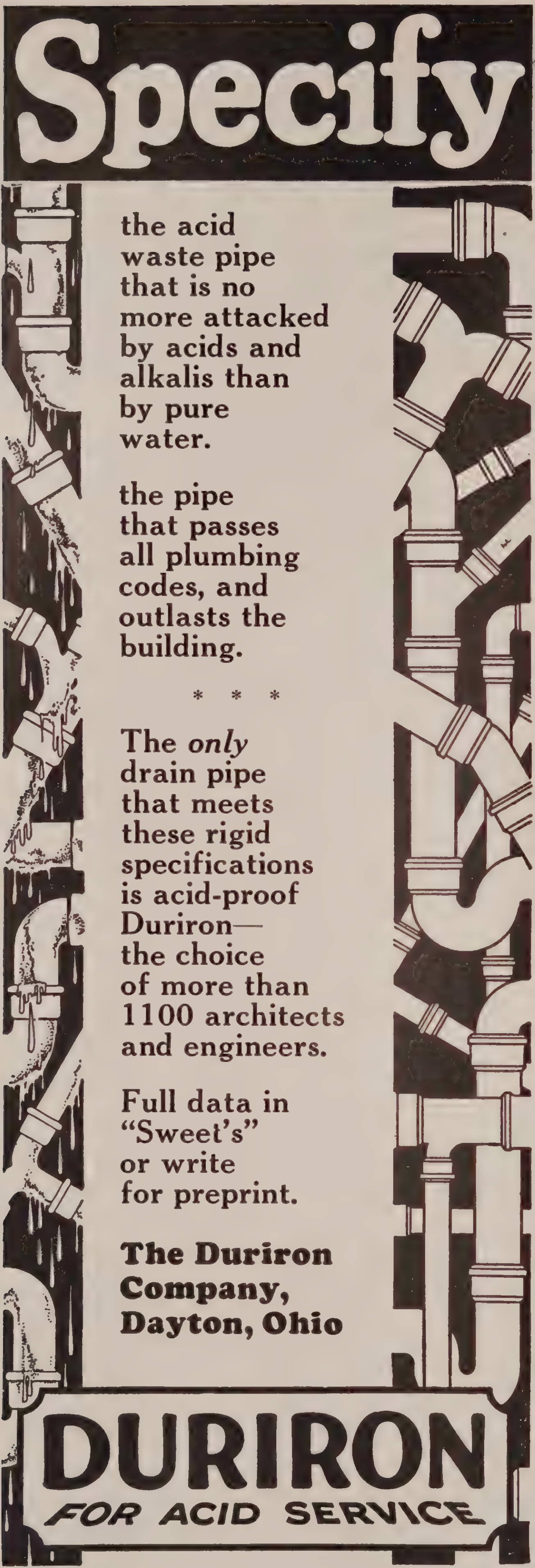

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the acid waste pipe that is no more attacked by acids and alkalis than by pure water.

the pipe that passes all plumbing codes, and outlasts the building.

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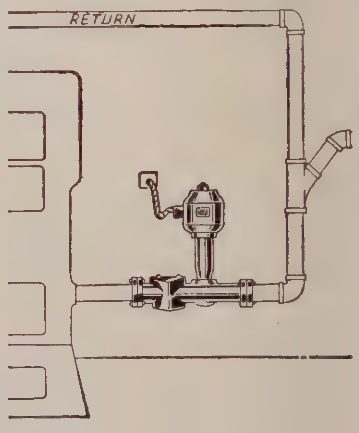

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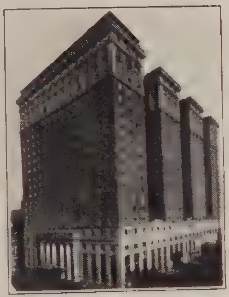

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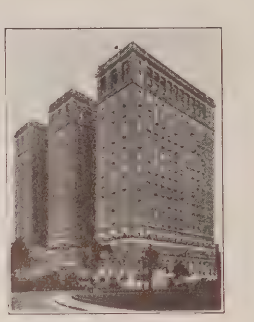

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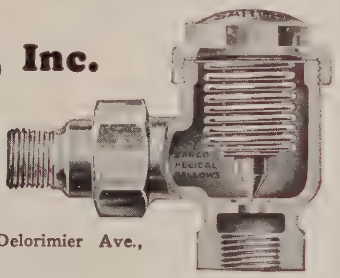

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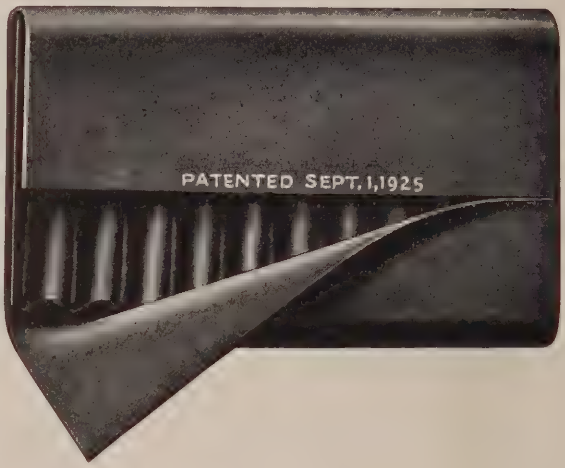

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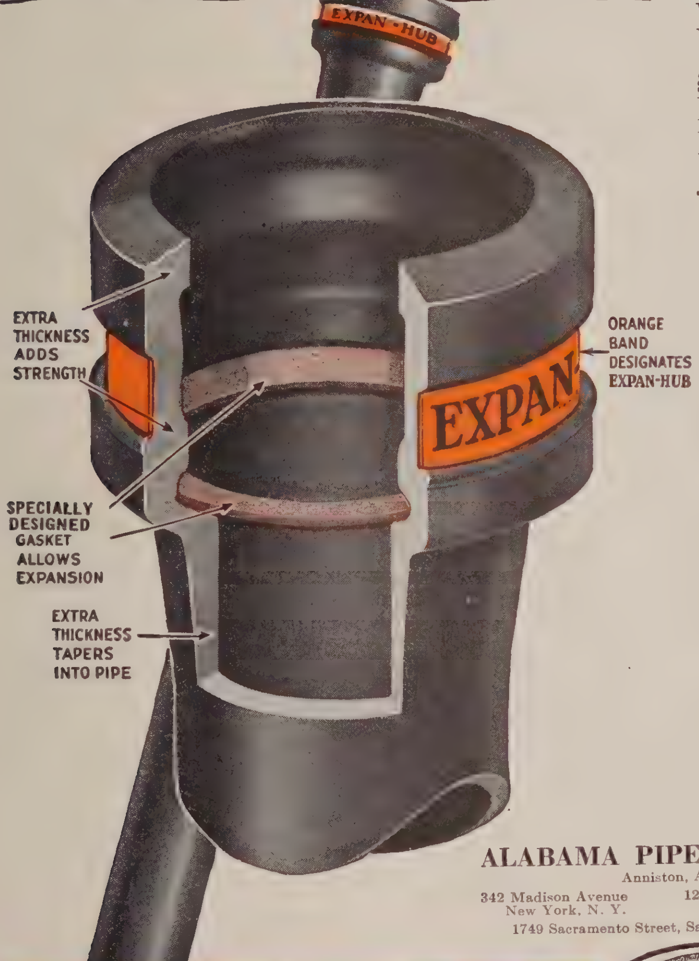
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ORANGE BAND DESIGNATES EXPAN-HUB
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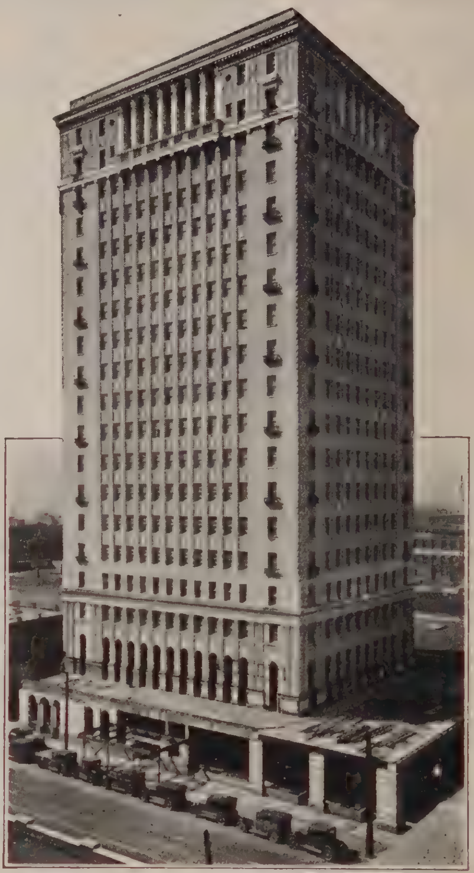

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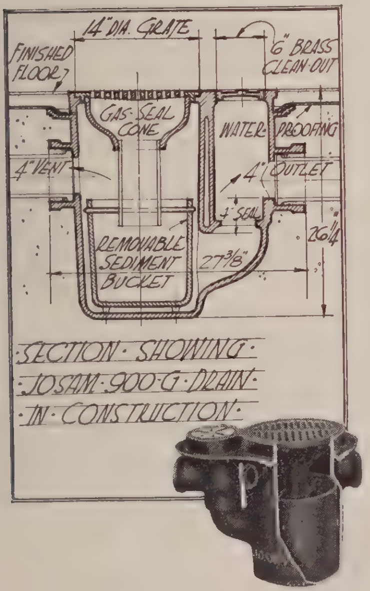

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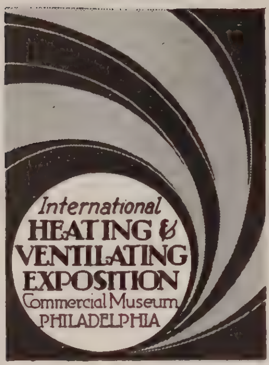

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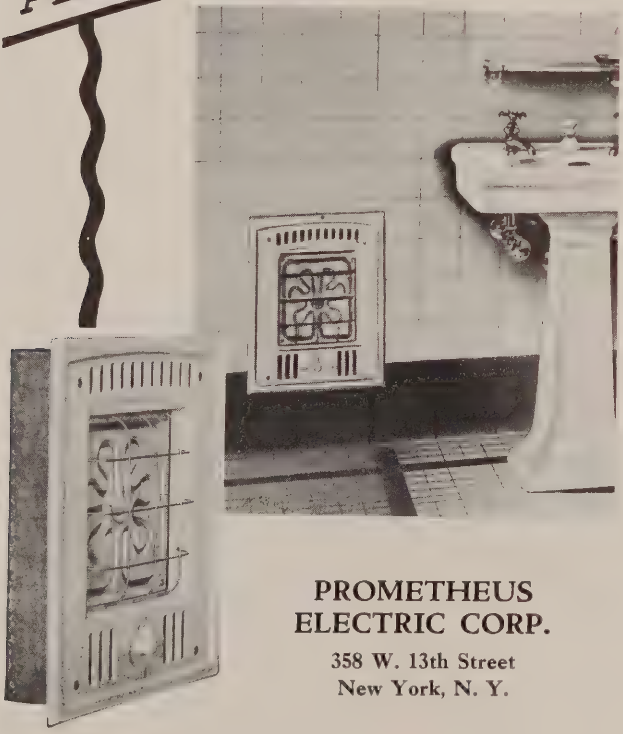

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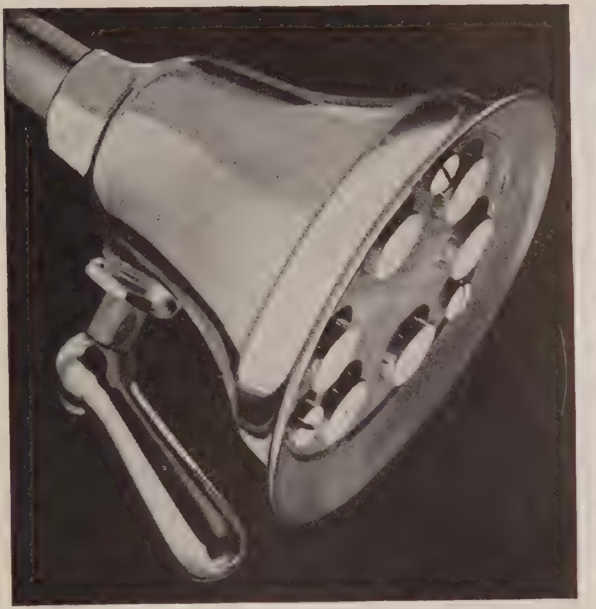
The fame of this revolutionary shower head extends throughout the architectural profession



K-3395 Patent Applied for

NOT just "a new shower head" but one so radically improved as to demand serious consideration for every type of installation.

Its superiorities are many:

Turns of the convenient lever make this improved Speakman Self-Cleaning Anystream Shower Head adjustable, giving any sort of spray the user wants. A coarse, sluicing, single stream . . . . a pleasant, normal spray . . . . a stinging, invigorating needle shower. The bather finds a variety of sprays to suit every purpose, from a refreshing, tonic bath to a single stream for shampooing the hair.

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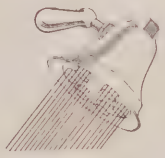
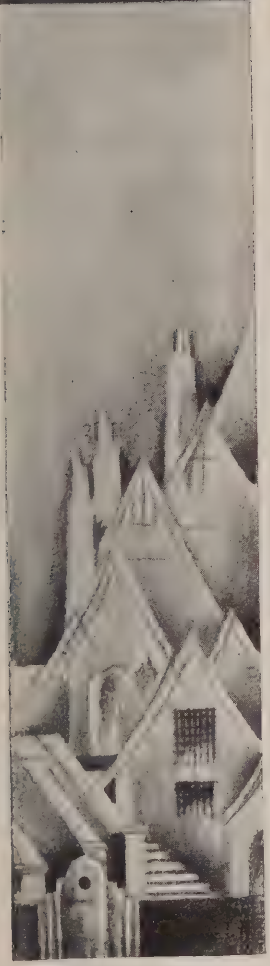
Finished in Speakman chromium plate and finely made in every detail, this new shower head is a worthy representative of unfailing Speakman quality. Speakman Company, Wilmington, Del.

A turn of the lever sluices all sediment away.



Another turn of the lever gives a normal spray.

Or you can adjust to a veritable stinging needle shower.



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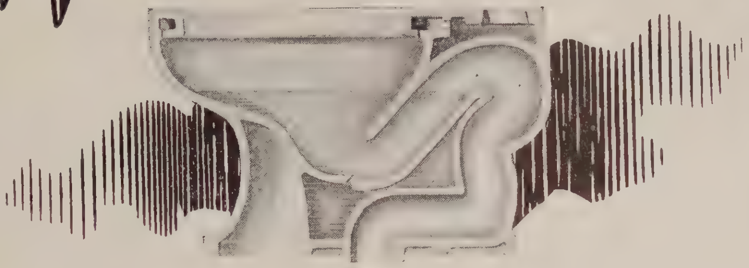

1 Unless a water closet is completely successful in flushing, it quickly becomes a source of trouble. An outstanding feature of the Exwite Welling is its oversize outlet passage, insuring the passing of objects which clog most closets.

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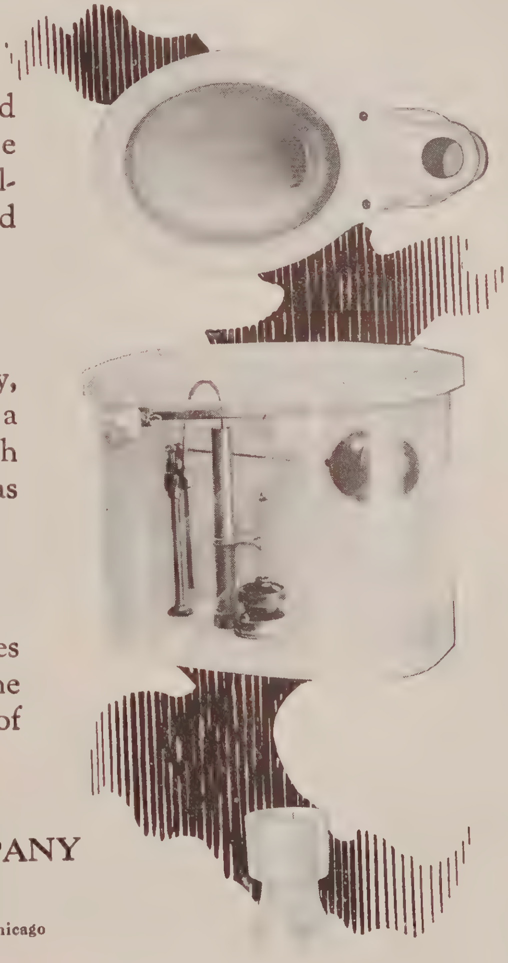

2 Then the water surface; extra large and covering entire surface of bowl. With the strong, positive action of the Exwite Welling, the purchaser is assured a clean and presentable bowl after every flush.

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3 No better tank fittings are made. Very, very few combinations have assembled a combination of fittings to compare with them. They are as near trouble-proof as such things can be.

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4 Then the China Connection. It removes the last trace of metal and, with the fine all-white seat, completes the picture of whiteness and cleanliness.

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TRENTON

THE TRENTON POTTERIES COMPANY

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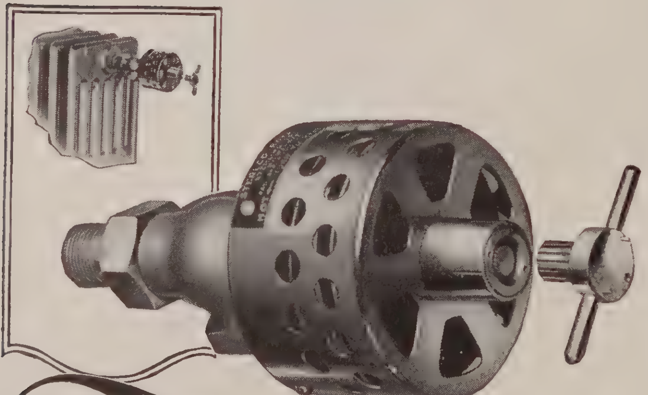
And *dependable economy* is the outstanding characteristic of the Thermotrol.

Dependable because it regulates room temperature accurately—economical because it saves that waste of fuel that is the result of thoughtless operation of uncontrolled heating. With the Thermotrol your customers can make one gallon of fuel oil or one ton of coal do the work of almost *two*.

Write for complete information.



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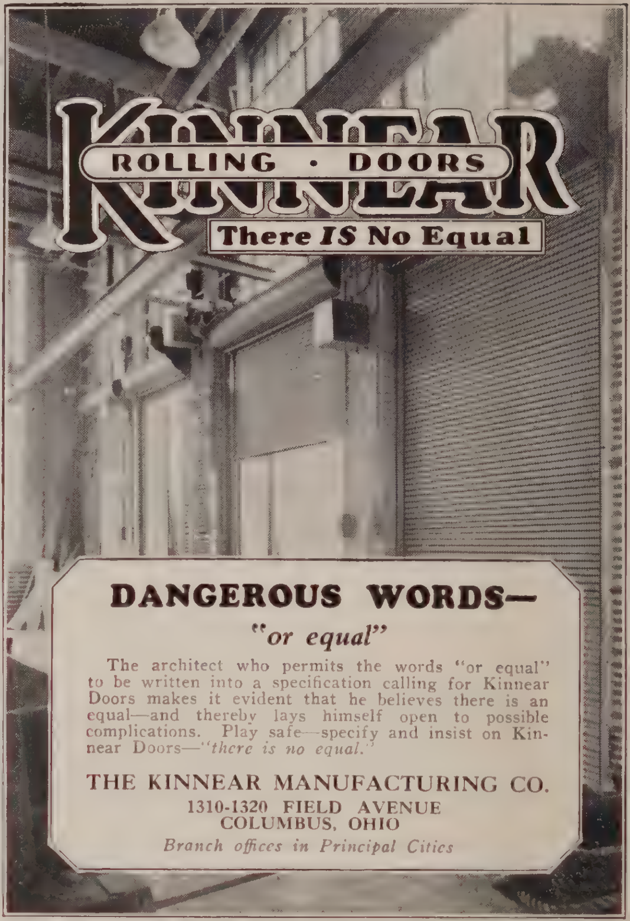


KINNEAR ROLLING · DOORS
There *IS* No Equal

DANGEROUS WORDS—

"or equal"

The architect who permits the words "or equal" to be written into a specification calling for Kinnear Doors makes it evident that he believes there is an equal—and thereby lays himself open to possible complications. Play safe—specify and insist on Kinnear Doors—*"there is no equal."*

THE KINNEAR MANUFACTURING CO.
1310-1320 FIELD AVENUE
COLUMBUS, OHIO
Branch offices in Principal Cities

American Theaters of Today

***By* R. W. SEXTON *and* B. F. BETTS**

With a Foreword by S. L. Rothafel ("Roxy")

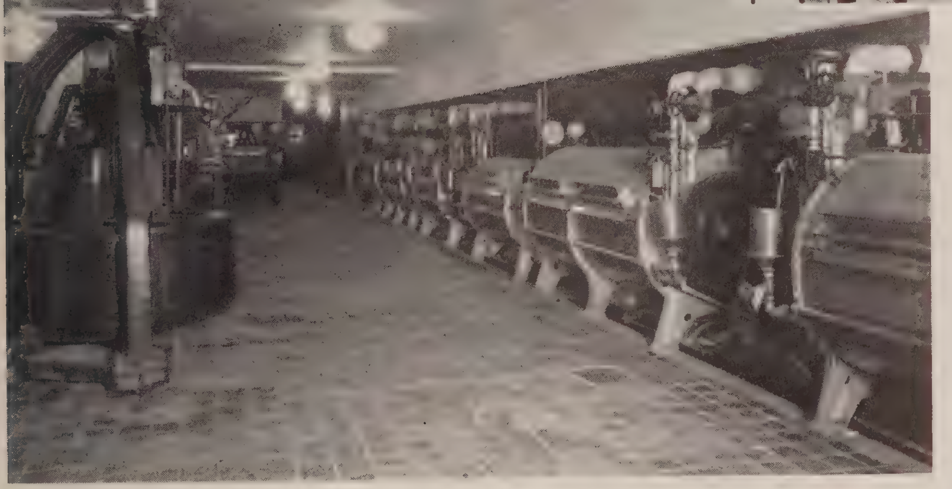
An extremely valuable and practical work on the modern theater, its design, plan, construction and equipment of every kind. The volume deals with theaters, large, small, and of medium size; with houses designed for presentation of various forms of drama and with other houses intended for the presentation of motion pictures. Lavishly illustrated, the work shows the exteriors and interiors of many theaters in all parts of America, giving their plans and in many instances their sections to show their construction, while the text deals with every part of the theater,—its lobby, auditorium, stage or projection room, and with every detail of equipment,—heating, cooling, ventilating, lighting, stage accessories, its stage mechanism, etc. A work invaluable to the architect who would successfully design a theater of any size or description.

175 pages, 9¼ x 12½ ins.
Price - - $12.50 Net

THE ARCHITECTURAL FORUM
521 Fifth Avenue New York

[No. 63 of a series of advertisements featuring prominent laundry installations]

A Canadian hotel, its *indispensable* laundry



The Royal York Hotel, Toronto, Ontario, Canada, owned and operated by the Canadian Pacific Railway Company, with a view of the monel metal Cascade Washers and Humatic Extractors in its indispensable laundry. This airy, well-lighted department was designed in collaboration with the engineers of The Canadian Laundry Machinery Company. Ross & Macdonald, Architects; Anglin-Norcross, General Contractors.

AMERICAN

...and a helpful service for you

THE Royal York Hotel, Toronto, has an enormous tonnage of soiled linens, fifty-two weeks every year. And how the laundry problem was solved so satisfactorily for this great Canadian hostelry is an interesting story—a story of architectural and laundry-engineering cooperation.

Architects frequently have occasion to counsel with The American Laundry Machinery Company in working out unusual laundry problems. If you are planning an institutional laundry of any type—in hotel, hospital, office or apartment building—"American" engineers can give you some helpful suggestions. Their services are at your disposal, any time.

THIS MAN can give you suggestions about floor-space dimensions, power requirements, wash-room troughings, lighting and ventilation—show you floor plans of scores of institutional laundries he has helped to plan and install.

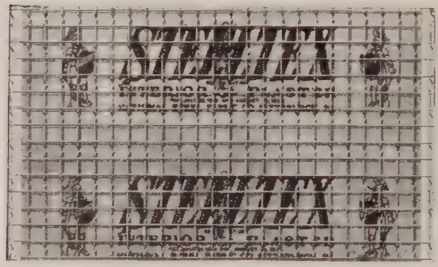
THE AMERICAN LAUNDRY MACHINERY COMPANY, *Norwood Station*, CINCINNATI, OHIO

The Canadian Laundry Machinery Co., Ltd., 47-93 Sterling Road, Toronto 3, Ont., Canada
Agents: British-American Laundry Machinery Co., Ltd., Underhill St., Camden Town, London, N.W.1, England.

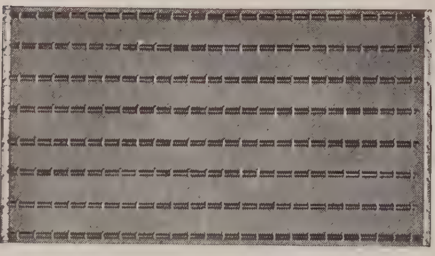
Your clients want permanent wall-beauty . . . insure it economically by *Ribbed STEELTEX*

37,000 sq. yds. of the NEW RIBBED STEELTEX safeguard walls and ceilings in this outstandingly beautiful modern apartment building, The Grenfell, now under construction at Kew Gardens, L. I., N. Y. Economy of construction, adaptability, and tenant satisfaction, no upkeep costs—influenced the Gormac Construction Corp., Brooklyn, N. Y., owners and builders, to build with reinforced plaster.

Wherever strength is most needed, as in plaster surfaces adjacent to exterior walls, RIBBED STEELTEX is used in The Chateau, Woodmere, L. I.—a striking new development in the New York metropolitan area. Reinforced plaster, which STEELTEX alone can provide, has stood the test of over a quarter of a million installations in all parts of the country.



Front view of the NEW RIBBED STEELTEX, showing reinforcing fabric and absorptive backing.



Back view of the NEW RIBBED STEELTEX, showing new V-shaped metal stiffening rib and heavier backing.

NOW RIBBED STEELTEX brings to walls and ceilings the strength of steel reinforcing and the economy of single-cost construction.

STEELTEX is not only outstandingly successful on the largest apartment jobs, where costs are checked to the last cent. It is no less economical on the most modest home. It adds nothing to the cost of the finished wall, yet provides the permanence of reinforced plaster, strengthened by rustproofed steel. The picture above shows Tudor Apartments, nearing completion at Rockville Center, Long Island, architect, Joseph Unger, Flushing, N. Y.; owners and builders, Ansid Realty Inc., Rockville Center, L. I., N. Y.

10 advantages of the New *Ribbed* Steeltex

1. New V-rib stiffener produces level lathing job of board-like rigidity.
2. Furring device assures embedment of reinforcing fabric.
3. Slab of uniform thickness assured—smooth in back as well as front.
4. All plaster functions in slab—no waste in keys or hangovers.
5. Plaster applies easily and stays put when applied.
6. New-type absorptive backing assures proper curing.
7. Nails up fast as any lath.
8. New-size sheets — 28½″ x 50″ — make this a one-man lath.
9. Easily cut with tin snips—easily shaped for angles.
10. Requires no change in customary operations, either lathing or plastering.

It alone makes plaster a permanent, one-cost building material, because RIBBED STEELTEX alone builds *reinforced plaster.*

What is reinforced plaster? It is plaster strengthened with embedded STEELTEX. Protecting against strains in all directions is a network of rustproofed steel. Attached to the steel is a tough absorptive fibrous backing.

When plaster is spread over RIBBED STEELTEX, it slides under the steel network, smooths out against the backing, and then additional plaster is spread over the steel. The resulting slab is uniformly thick, and continuously reinforced by a network of completely embedded steel.

The new V-rib metal stiffeners that truss each sheet of RIBBED STEELTEX assure a correct lathing job. Plaster applies easily. The new-type, absorptive backing, to which the plaster clings tight, assures proper curing. And it provides the added factor of insulation — also sound-deadening.

National Steel Fabric Company

DIVISION OF
Pittsburgh Steel Co.

3612 Union Trust Bldg. Pittsburgh, Pa.

the New *Ribbed* STEELTEX

"BUILDS LIFETIME WALLS AND CEILINGS"

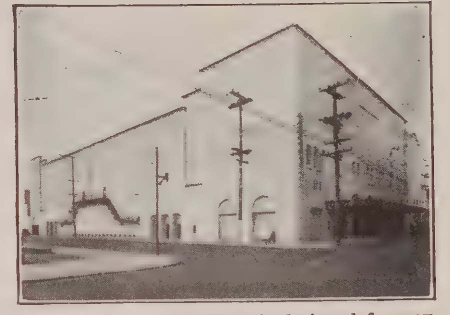
When you use *STEELTEX* for Floors you combine strength, approved construction methods, and outstanding economy

STEELTEX FOR FLOORS was introduced to the architectural and engineering professions less than two years ago. Today it is the accepted concrete floor method for all light steel joist construction.

Its widespread use in apartments, hotels, churches, schools, theatres, hospitals, and office buildings from coast to coast, proves the economy and adaptability of this modern floor material, which is a combined steel reinforcing and concrete form.

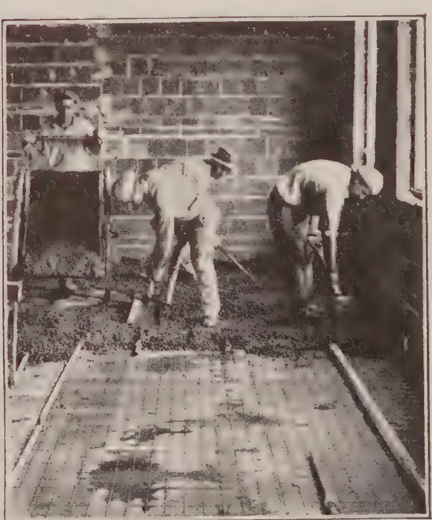
These STEELTEX results, a few of which are pictured on this page, tell their own story. We would like to send you complete details about STEELTEX FOR FLOORS. Please write us for them.

This is the most modern of stables—polo stables at the Dayton Country Club, Dayton, Ohio, architect, H. Lorenz. The backing of STEELTEX FOR FLOORS is of sufficient strength to afford safe walking surface, once the fabric has been attached to the joists.



STEELTEX FOR FLOORS is designed for any type of metal beam or truss. Rolls are quickly set in place and attached to the joists in continuous strips from one side of the building to the other. Illustration shows the Dreamland Auditorium, San Francisco, Cal., Ward and Blohme, architects.

80,000 sq. ft. of STEELTEX FOR FLOORS strengthen and protect this attractive apartment building, 4011 Delmar Blvd., St. Louis, Mo. STEELTEX acts as a combined reinforcing and concrete form—saving time, labor, material, and money.



The backing of STEELTEX FOR FLOORS assures proper water-cement ratio during curing, automatic embedment of the reinforcing wires without any labor for blocking up, or for pouring slab in two operations, and a minimum of clean-up trouble and expense.

Other products of the National Steel Fabric Company

Ribbed Steeltex for Plaster, Steeltex for Stucco, Steeltex for Brick and Stone Facing, Steeltex for Floors and Roofs (concrete or gypsum)—same principle, same protection. National Reinforcing for all other types of concrete construction — buildings, roads, streets, sidewalks, dams, canals, concrete pipe, cement gun work. Made by the world's largest manufacturers of welded steel fabric.

10 advantages of Steeltex for Floors

1. Eliminates wood or metal forms.
2. Steel properly embedded automatically—full strength developed as true reinforcing.
3. Time and labor saved—quickly cut from roll and easily attached, to any type beam.
4. Saves concrete. Minimizes droppings.
5. Water-cement ratio maintained—assuring full strength of concrete.
6. Proper curing assured.
7. Eliminates clean-up expense.
8. Sound deadening factor especially desirable in hotels, schools, hospitals, and apartments.
9. Permanence of reinforcing guaranteed by heavily galvanized mesh.
10. Temperature stresses resisted and reinforcing correctly spaced, without necessity of inspection or special handling to cover these points.

"The logical floor method"

STEELTEX

FOR FLOORS AND ROOFS

PYRAMIDS FOR PERMANENT INSTALLATIONS
CASTOR FOR PORTABLE CHECKING

DE SAUSSURE EQUIPMENT *for the* CHECK ROOM

Make your Specifications from this Complete Line of all-Steel Unit Fixtures

De Saussure Duplicate Checking Systems

All De Saussure check-racks are made to operate with this duplicate checking system—fast and fool-proof. The fibre disc is given to the patron while the metal clip, numbered to correspond, is attached to the garment. With this system, garments may be piled on counter during rush periods, to be hung away when the pressure eases up. Service is faster, and the metal clip positively prevents mistakes.

Where a hotel or institution operates more than one check-room, fibre discs are supplied in a variety of colors—a distinct color for each check-room. This system prevents errors and enables employees to direct guests to proper check-room at a glance.

ENDLESS annoyance and alteration expense is caused to hotel and club managements through old-fashioned or home-made checking facilities.

Now De Saussure all-steel check-rack units enable the architect to specify complete checking systems based on the probable guest traffic.

De Saussure hat and coat racks are made in three styles—floor-type and wall-type racks for permanent installation, and portable racks to provide temporary or emergency checking facilities. A combination of these three types yields maximum checking capacity with minimum floor space.

Racks are all-steel, electrically welded throughout. This feature eliminates breakage expense, keeps check-room permanently neat and orderly looking, and assures perfect care of garments.

Portable racks are assembled without nuts or bolts. Can be quickly set-up or knocked down by one man without use of tools. When knocked down, portable racks store in two square feet of floor space. Supplied with either "Perfect" rubber tire castors or iron floor-gripping pyramids—instantly interchangeable.

We have prepared for your reference files a circular describing De Saussure check-room equipment in detail. Write to:

Wilcox MFG. CO.

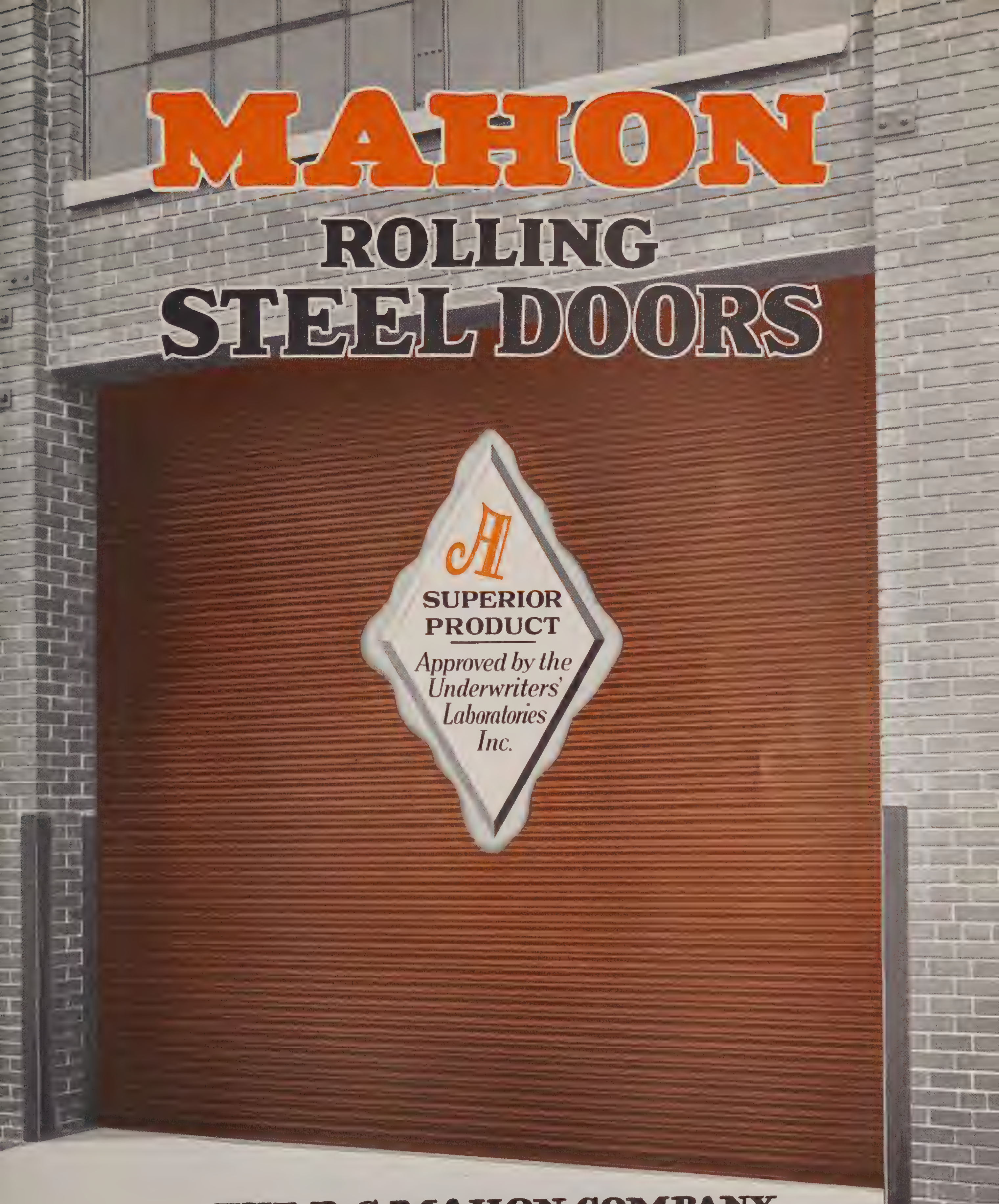
Fair Prices
Prompt Shipment

562 W. Randolph St.
Chicago, Ill.

Exclusive National Distributors of DE SAUSSURE Hotel Administrative Equipment—CHECKING SYSTEMS, ROOM INFORMATION RACKS, MAIL *and* KEY RACKS, *etc.*

MAHON

ROLLING STEEL DOORS



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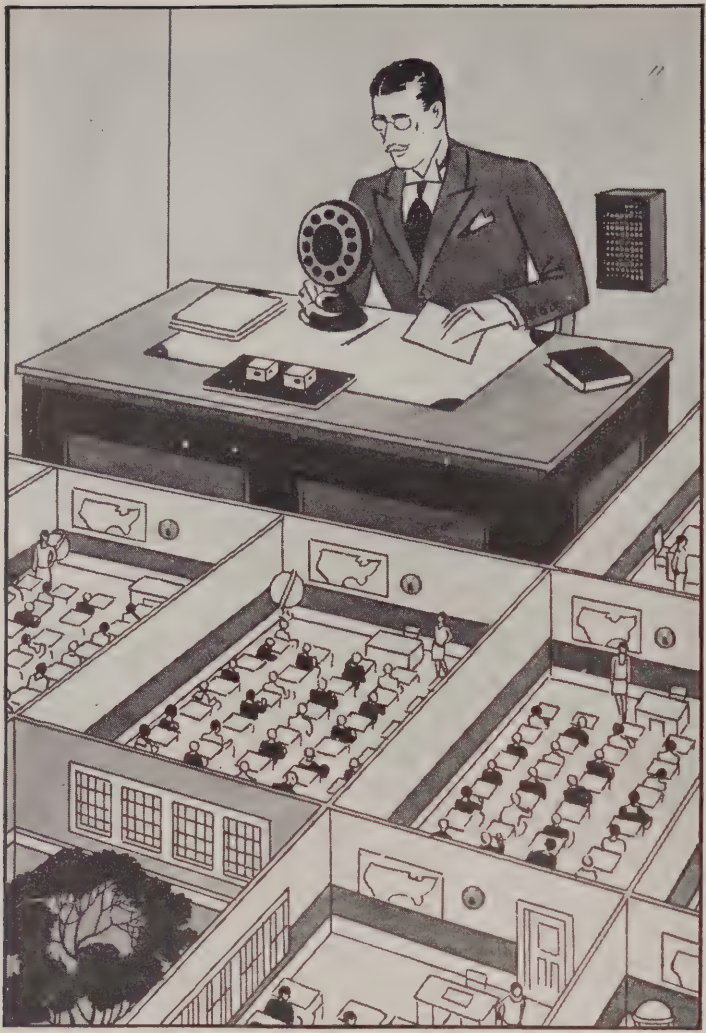
DETROIT, MICHIGAN

For every industrial or commercial requirement Mahon Rolling Steel Doors provide the utmost in fire and burglar protection. ¶ Mahon's vast manufacturing facilities permit economical production of these doors with an unusual degree of accuracy and fine workmanship in every detail. Write today for complete data.



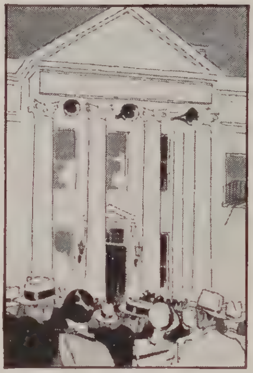
AS IF ALL ROOMS WERE ONE

The same voice—the same music—can now be heard in *every room of a building at once,* if desired. No matter how big the building . . . One room—or a thousand rooms or more—it's all the same to the Western Electric Public Address System.

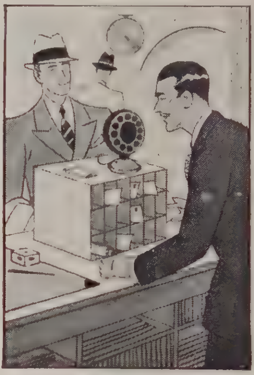
In this, more and more progressive architects recognize a real *opportunity*—an opportunity to serve their clients in a new and far-reaching manner.

This sound distribution equipment has become an important accessory of the *modern* public structure. In the civic installation it renders a public service. In the commercial building—hotels, clubs, amusement places—it leads to greater profits, by providing better entertainment. Wherever applied, its uses are endless in number.

It can pick up radio—or it may be speech—entertainment—supplied directly by microphone. Or it may be accurately rendered music from the Western Electric Music Reproducer . . . For full information, consult Sweet's Catalogue. Or send for interesting booklet to the distributor, Graybar Electric Co., Graybar Building, New York, N. Y. Offices in 72 principal cities.



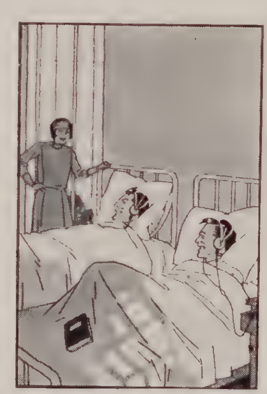
The last word in municipal buildings—one that can talk! *—and make itself heard.*



For hotels—paging by loudspeaker. And a hundred other uses—all important.

An auxiliary fire-alarm in schools. Line of march can be switched. Other uses, too.

On with the dance! An especially popular application for clubs, hotels, restaurants, etc.



One way to wire up a hospital for happiness. Healing by music has a real value.

It hooks up with radio. Brings into a building everything that's on the air.

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PUBLIC ADDRESS AND MUSIC REPRODUCTION SYSTEMS

Distributed by Graybar Electric Company

Selected List of Manufacturers' Publications

FOR THE SERVICE OF ARCHITECTS, ENGINEERS, DECORATORS, AND CONTRACTORS

The publications listed in these columns are the most important of those issued by leading manufacturers identified with the building industry. They may be had without charge unless otherwise noted, by applying on your business stationery to *The Architectural Forum*, 521 Fifth Ave., New York, or the manufacturer direct, in which case kindly mention this publication.

ACOUSTICS

R. Guastavino Co., 40 Court St., Boston.

Akoustolith Plaster. Brochure, 6 pp., 8½ x 11 ins. Important data on a valuable material.

Johns-Manville Corporation, New York.

Sound-Absorbing Treatment in Banks and Offices. Booklet, 18 pp., 8½ x 11 ins. Illustrated.

Sound-Absorbing Treatment in Churches and Religious Institutions. Brochure. 22 pp., 8½ x 11 ins. Illustrated.

U. S. Gypsum Co., 205 W. Monroe St., Chicago, Ill.

A Scientific Solution of an Old Architectural Problem. Folder, 6 pp., 8½ x 11 ins. Describes Sabinite Acoustical Plaster.

ASH HOISTS

Gillis & Geoghegan, Inc., 544 West Broadway, New York.

G & G Telescopic Hoist catalog, 8½ x 11 A. I. A. Standard Classification 30il, contains complete descriptions, method of selecting correct model to fit the building's needs, scaled drawings showing space requirements and specifications.

ASH HOISTS—TELESCOPIC

Gillis & Geoghegan, Inc., 544 West Broadway, New York.

G & G Telescopic Hoist catalog, 8½ x 11 A. I. A. Standard Classification 30il, contains complete descriptions, method of selecting correct model to fit the building's needs, scaled drawings showing space requirements and specifications.

BRICK

American Face Brick Association, 1751 Peoples Life Building, Chicago, Ill.

Brickwork in Italy. 298 pp., size 7½ x 10½ ins., an attractive and useful volume on the history and use of brick in Italy from ancient to modern times, profusely illustrated with 69 line drawings, 300 half-tones, and 20 colored plates, with a map of modern and XII century Italy. Bound in linen. Price now $3.00, postpaid (formerly $6.00). Half Morocco, $7.00.

Industrial Buildings and Housing. Bound Volume, 112 pp., 8½ x 11 ins. Profusely illustrated. Deals with the planning of factories and employes' housing in detail. Suggestions are given for interior arrangements, including restaurants and rest rooms. Price now $1.00 postpaid (formerly $2.00).

Hanley Company, Bradford, Pa.

General Catalog. 16 pp. 8½ x 11 ins. Illustrated.

Bradford Reds. Folder. 8 pp., 3 x 8 ins. Illustrated.

CABINET WORK

Henry Klein & Co., 25 Grand Street, Elmhurst, L. I., N. Y.

Driwood Period Mouldings in Ornamented Wood. Brochure, 28 pp., 8½ x 11 ins. Illustrated.

Ensemble Offices for the Banker and Broker. Folder. 4 pp., 8½ x 11 ins. Illustrated.

Luxurious Office Partitions in Walnut, Mahogany and Quartered Oak. Folder. 4 pp., 8½ x 11 ins. Illustrated.

CEMENT

Carney Company, The, Mankato, Minn.

A Remarkable Combination of Quality and Economy. Booklet, 20 pp., 8½ x 11 ins. Illustrated. Important data on valuable material.

Kosmos Portland Cement Company, Louisville, Ky.

Kosmortar for Enduring Masonry. Folder, 6 pp., 3½ x 6½ ins. Data on strength and working qualities of Kosmortar.

Kosmortar, the Mortar for Cold Weather. Folder, 4 pp., 3⅜ x 6½ ins. Tells why Kosmortar should be used in cold weather.

Louisville Cement Co., 315 Guthrie St., Louisville, Ky.

BRIXMENT for Perfect Mortar. Self-filing handbook, 8⅜ x 11 ins. 16 pp. Illustrated. Contains complete technical description of BRIXMENT for brick, tile and stone masonry, specifications, data and tests.

Portland Cement Association, Chicago, Ill.

Concrete Masonry Construction. Booklet, 48 pp., 8½ x 11 ins. Illustrated. Deals with various forms of construction.

Town and Country Houses of Concrete Masonry. Booklet, 20 pp., 8½ x 11 ins. Illustrated.

Facts About Concrete Building Tile. Brochure, 16 pp., 8½ x 11 ins. Illustrated.

The Key to Firesafe Homes. Booklet, 20 pp., 8½ x 11 ins. Illustrated.

Design and Control of Concrete Mixers. Brochure, 32 pp., 8½ x 11 ins. Illustrated.

Portland Cement Stucco. Booklet, 64 pp., 8½ x 11 ins. Illustrated.

CEMENT—Continued

Concrete in Architecture. Bound Volume, 60 pp., 8½ x 11 ins. Illustrated. An excellent work, giving views of exteriors and interiors.

CHURCH EQUIPMENT

John Van Range Co., Cincinnati.

Practical Planning for Church Food Service. Booklet, 32 pp., 8½ x 11 ins. Illustrated.

CONCRETE BUILDING MATERIALS

Concrete Steel Company, 42 Broadway, New York.

Modern Concrete Reinforcement. Booklet, 32 pp., 8½ x 11 ins. Illustrated.

Kosmos Portland Cement Company, Louisville, Ky.

High Early Strength Concrete, Using Standard Kosmos Portland Cement. Folder, 1 page, 8½ x 11 ins. Complete data on securing high strength concrete in short time.

CONCRETE COLORINGS

The Master Builders Co., 7016 Euclid Ave., Cleveland.

Color Mix, Colored Hardened Concrete Floors (integral). Brochure, 16 pp., 8½ x 11 ins. Illustrated. Data on coloring for floors.

Dychrome. Concrete Surface Hardener in Colors. Folder, 4 pp., 8 x 11 ins. Illustrated. Data on a new treatment.

CONSTRUCTION, FIREPROOF

Master Builders Co., Cleveland, Ohio.

Color Mix. Booklet, 18 pp., 8½ x 11 ins. Illustrated. Valuable data on concrete hardener, waterproofer and dustproofer in permanent colors.

National Fire Proofing Co., 250 Federal St., Pittsburgh, Pa.

Standard Fire Proofing Bulletin 171. 8½ x 11 ins., 32 pp. Illustrated. A treatise on fireproof floor construction.

North Western Expanded Metal Co., 1234 Old Colony Building, Chicago, Ill.

North Western Expanded Metal Products. Booklet, 8½ x 10¾ ins. 16 pp. Fully illustrated, and describes different products of this company, such as Kno-burn metal lath, 20th Century Corrugated, Plaster-Sava and Longspan lath channels, etc.

A. I. A. Sample Book. Bound volume, 8½ x 11 ins., contains actual samples of several materials and complete data regarding their use.

CONSTRUCTION, STONE AND TERRA COTTA

Cowing Pressure Relieving Joint Company, 100 North Wells St., Chicago, Ill.

Pressure Relieving Joint for Buildings of Stone, Terra Cotta or Marble. Booklet, 16 pp., 8½ x 11 ins. Illustrated. Deals with preventing cracks, spalls and breaks.

DAMPPROOFING

The Master Builders Co., 7016 Euclid Ave., Cleveland.

Waterproofing and Dampproofing Specification Manual. Booklet, 18 pp., 8½ x 11 ins. Deals with methods and materials used.

Waterproofing and Dampproofing. File. 36 pp. Complete descriptions and detailed specifications for materials used in building and concrete.

Minwax Company, Inc., 11 West 42nd St., New York.

Complete Index of all Minwax Products. Folder, 6 pp., 8½ x 11 ins. Illustrated. Complete description and detailed specifications.

Sonneborn Sons, Inc., L., 116 Fifth Ave., New York.

Specification Sheet, 8½ x 11 ins. Descriptions and specifications of compounds for dampproofing interior and exterior surfaces.

Toch Brothers, New York, Chicago, Los Angeles.

Handbook of R. I. W. Protective Products. Booklet, 40 pp., 4½ x 7½ ins.

DOORS

David Lupton's Sons Company, Philadelphia.

Lupton Commercial Steel Doors. Folder. 8½ x 11 ins. Illustrated.

Lupton Steel Industrial Doors. Brochure. 8 pp., 8½ x 11 ins. Illustrated. Details and specifications.

DOORS AND TRIM, METAL

The American Brass Company, Waterbury, Conn.

Anaconda Architectural Bronze Extruded Shapes. Brochure, 180 pp., 8½ x 11 ins., illustrating and describing more than 2,000 standard bronze shapes of cornices, jamb casings, mouldings, etc.

REQUEST FOR CATALOGS

To get any of the catalogs described in this section, put down the title of the catalog desired, the name of the manufacturer and send coupon to THE ARCHITECTURAL FORUM, 521 Fifth Avenue, New York.

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Name .... Business ....

Address ....

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 185*

DOORS AND TRIM, METAL—Continued

The Kawneer Company, Niles, Michigan.
Detail sheet, 8½ x 11 ins., with A.I.A. File No. featuring Heavy Welded Bronze Doors.

Richards-Wilcox Mfg. Co., Aurora, Ill.
Fire-Doors and Hardware. Booklet, 8½ x 11 ins., 64 pp. Illustrated. Describes entire line of tin-clad and corrugated fire doors, complete with automatic closers, track hangers and all the latest equipment—all approved and labeled by Underwriters' Laboratories.

Truscon Steel Company, Youngstown, Ohio.
Copper Alloy Steel Doors. Catalog 110. Booklet, 48 pp., 8½ x 11 ins. Illustrated.

DOORS, SOUNDPROOF

Irving Hamlin, Evanston, Ill.
The Evanston Soundproof Door. Folder, 8 pp., 8½ x 11 ins. Illustrated. Deals with a valuable type of door.

DRAINAGE FITTINGS

Josam Mfg. Co., Michigan City, Ind.
Josam Products. Booklet, 73 pp., 8½ x 11 ins. Illustrated. A valuable line of accessories.
Josam-Marsh Grease, Plaster, Sediment and Hair Interceptors. Brochure. 7 pp., 8½ x 11 ins. Illustrated.
Josam New Saw Tooth-Roof Drain. Folder, 4 pp., 8½ x 11 ins. Illustrated.

DUMBWAITERS

Sedgwick Machine Works, 151 West 15th St., New York, N. Y.
Catalog and Service Sheets. Standard specifications, plans and prices for various types, etc. 4¼ x 8¼ ins., 60 pp. Illustrated.
Catalog and pamphlets, 8½ x 11 ins. Illustrated. Valuable data on dumbwaiters.

ELECTRICAL EQUIPMENT

Bryant Electric Company, Bridgeport, Conn.
HooKeX Plug and Receptacle. Folder, 6 pp., 3½ x 6¼ ins. Illustrated.
KeNeX Plug and Receptacle. Folder, 6 pp., 3½ x 6¼ ins. Illustrated.
Three-wire Polarized Caps and Receptacles. Leaflet, 8½ x 10 ins. Illustrated.
Three-wire Polarized Caps and Receptacles for Heavy Duty. Leaflet, 8½ x 10 ins. Illustrated.

General Electric Co., Merchandise Dept., Bridgeport, Conn.
Wiring System Specification Data for Apartment Houses and Apartment Hotels. Booklet, 20 pp., 8 x 10 ins. Illustrated.
Electrical Specification Data for Architects. Brochure, 36 pp., 8 x 10½ ins. Illustrated. Data regarding G. E. wiring materials and their use.
The House of a Hundred Comforts. Booklet, 40 pp., 8 x 10½ ins. Illustrated. Dwells on importance of adequate wiring.

Harvey Hubbell, Inc., Bridgeport, Conn.
Electrical Specialties. Catalog No. 19. 52 pp., 8½ x 10 ins. Illustrated.

Pick-Barth Company, Inc., Albert, 1200 West 35th St., Chicago, and Cooper Square, New York.
School Cafeterias. Booklet, 6 x 9 ins. Illustrated. The design and equipment of school cafeterias with photographs of installation and plans for standardized outfits.

Prometheus Electric Corporation, 360 West 13th St., New York.
Electric Heating Specialties. Booklet, 24 pages. 8½ x 11 ins. Illustrated. Specialties for heating, cooking, hospitals, organ lofts, etc.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Electric Power for Buildings. Brochure, 14 pp., 8½ x 11 ins. Illustrated. A publication important to architects and engineers.
Variable-Voltage Central Systems as Applied to Electric Elevators. Booklet, 12 pp., 8½ x 11 ins. Illustrated. Deals with an important detail of elevator mechanism.
Modern Electrical Equipment for Buildings. Booklet, 8½ x 11 ins. Illustrated. Lists many useful appliances.
Electrical Equipment for Heating and Ventilating Systems. Booklet, 24 pp., 8½ x 11 ins. Illustrated. This is "Motor Application Circular 7379."
Westinghouse Panelboards. Catalog 224. Booklet, 64 pp., 8½ x 11 ins. Illustrated.
Beauty; Power; Silence; Westinghouse Fans. (Dealer Catalog 45.) Brochure, 16 pp., 8½ x 11 ins. Illustrated. Valuable information on fans and their uses.
Electric Range Book for Architects (A. I. A. Standard Classification 31 G-4). Booklet, 24 pp., 8½ x 11 ins. Illustrated. Cooking apparatus for buildings of various types.
Westinghouse Commercial Cooking Equipment (Catalog 280). Booklet, 32 pp., 8½ x 11 ins. Illustrated. Equipment for cooking on a large scale.
Electric Appliances (Catalog 44-A). 32 pp., 8½ x 11 ins. Deals with accessories for home use.

ELEVATORS

Otis Elevator Company, 260 Eleventh Ave., New York, N. Y.
Otis Push Button Controlled Elevators. Descriptive leaflets, 8½ x 11 ins. Illustrated. Full details of machines, motors and controllers for these types.
Otis Geared and Gearless Traction. Elevators of All Types. Descriptive leaflets, 8½ x 11 ins. Illustrated. Full details of machines, motors and controllers for these types.
Escalators. Booklet, 8½ x 11 ins., 22 pp. Illustrated. Describes use of escalators in subways, department stores, theaters and industrial buildings. Also includes elevators and dock elevators.

Richards-Wilcox Mfg. Co., Aurora, Ill.
Elevators. Booklet, 8½ x 11 ins., 24 pp. Illustrated. Describes complete line of "Ideal" elevator door hardware and checking devices, also automatic safety devices.

Sedgwick Machine Works, 151 West 15th St., New York, N. Y.
Catalog and descriptive pamphlets, 4¼ x 8¼ ins., 70 pp. Illustrated. Descriptive pamphlets on hand power freight elevators, sidewalk elevators, automobile elevators, etc.
Catalog and pamphlets, 8½ x 11 ins. Illustrated. Important data on different types of elevators.

ESCALATORS

Otis Elevator Company, 260 Eleventh Ave., New York, N. Y.
Escalators. Booklet, 32 pp., 8½ x 11 ins. Illustrated. A valuable work on an important item of equipment.

FIREPLACE CONSTRUCTION

H. W. Covert Company, 243 East 44th Street, New York, N. Y.
Covert Fireplace Construction. Booklet, 12 pp., 8½ x 11 ins. Illustrated. Valuable data on an important topic.

FIREPROOFING

Concrete Engineering Co., Omaha, Neb.
Handbook of Fireproof Construction. Booklet, 54 pp., 8½ x 11 ins. Valuable work on methods of fireproofing.

Concrete Steel Company, 42 Broadway, New York.
Economical Fireproof Floors for Suburban Buildings. Folder. 4 pp., 8½ x 11 ins. Illustrated.

North Western Expanded Metal Co., 407 South Dearborn Street, Chicago, Ill.
A. I. A. Sample Book. Bound volume, 8½ x 11 ins. Contains actual samples of several materials and complete data regarding their use.

FLOOR HARDENERS (CHEMICAL)

Master Builders Co., Cleveland, Ohio.
Concrete Floor Treatment. File, 50 pp. Data on securing hardened dustproof concrete.
Concrete Floor Treatments—Specification Manual. Booklet, 24 pp., 8½ x 11 ins. Illustrated. Valuable work on an important subject.

Minwax Company, 11 West 42nd Street, New York, N. Y.
Concrete Floor Treatments. Folder, 4 pp., 8½ x 11 ins. Illustrated.

Sonneborn Sons, Inc., L., 116 Fifth Ave., New York, N. Y.
Lapidolith, the liquid chemical hardener. Complete sets of specifications for every building type in which concrete floors are used, with descriptions and results of tests.

Toch Brothers, New York, Chicago, Los Angeles.
Handbook of R.I.W. Protective Products. Booklet, 40 pp., 4½ x 7½ ins.

FLOORS—STRUCTURAL

Concrete Steel Company, 42 Broadway, New York.
Structural Economies for Concrete Floors and Roofs. Brochure, 32 pp., 8½ x 11 ins. Illustrated.

Truscon Steel Co., Youngstown, Ohio.
Truscon Floretyle Construction. Booklet, 8½ x 11 ins., 16 pp. Illustrations of actual jobs under construction. Lists of properties and information on proper construction. Proper method of handling and tables of safe loads.

Structural Gypsum Corporation, Linden, N. J.
Gypsteel Pre-cast Fireproof Floors. Booklet, 36 pp., 8½ x 11 ins. Illustrated. Data on flooring.

FLOORING

Armstrong Cork Co. (Linoleum Division), Lancaster, Pa.
Armstrong's Linoleum Floors. Catalog, 8½ x 11 ins., 44 pp. Color plates. A technical treatise on linoleum, including table of gauges and weights and specifications for installing linoleum floors. Newly revised, February, 1929.
Armstrong's Linoleum Pattern Book, 1929. Catalog, 9 x 12 ins., 44 pp. Color plates. Reproduction in color of all patterns of linoleum and cork carpet in the Armstrong line.
Linoleum Layer's Handbook. 5 x 7 ins., 36 pp. Instructions for linoleum layers and others interested in learning most satisfactory methods of laying and taking care of linoleum.
Enduring Floors of Good Taste. Booklet, 6 x 9 ins., 48 pp. Illustrated in color. Explains use of linoleum for offices, stores, etc., with reproductions in color of suitable patterns, also specifications and instructions for laying.

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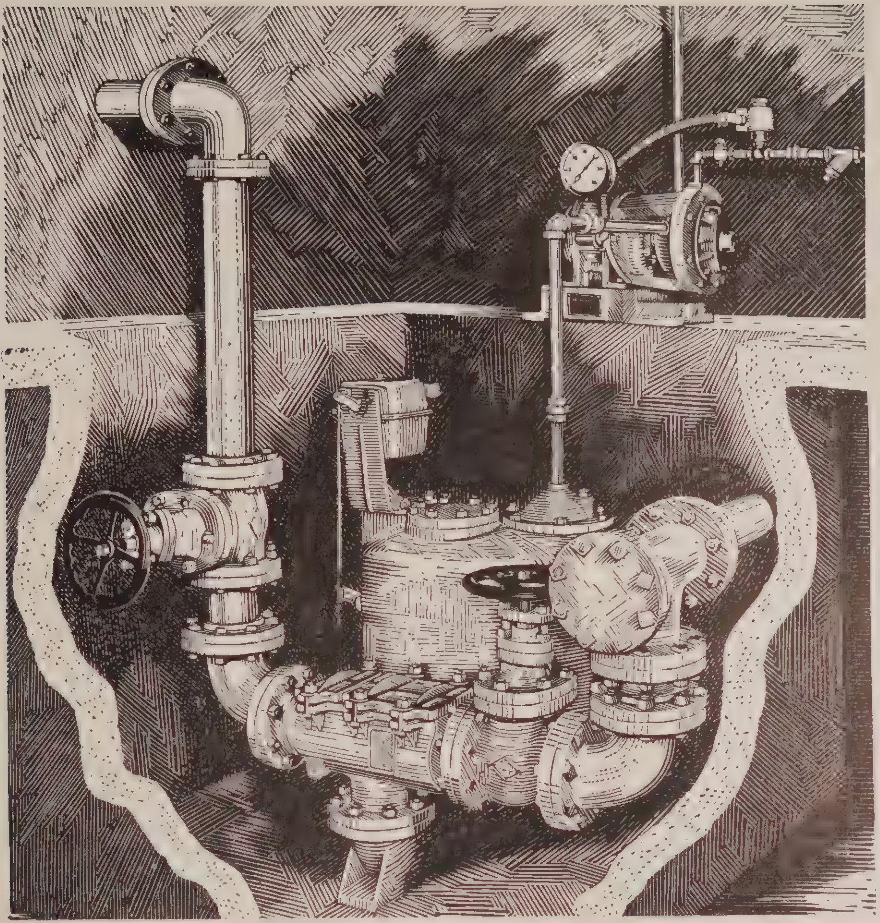

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Jennings Pumps

THE NASH ENGINEERING CO. 12 WILSON ROAD, SOUTH NORWALK, CONN.

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 186*

FLOORING—Continued

Blabon Company, Geo. W., Nicetown, Philadelphia, Pa.

Planning the Color Schemes for Your Home. Brochure, illustrated in color; 36 pp., 7½ x 10½ ins. Gives excellent suggestions for use of color in flooring for houses and apartments.

Handy Quality Sample Folder of Linoleums. Gives actual samples of "Battleship Linoleum," cork carpet, "Feltex," etc.

Blabon's Linoleum. Booklet, illustrated in color; 128 pp., 3½ x 8½ ins. Gives patterns of a large number of linoleums.

Blabon's Plain Linoleum and Cork Carpet. Gives quality samples, 3 x 6 ins. of various types of floor coverings.

Cellized Oak Flooring, Memphis, Tenn.

Style in Oak Floors. Booklet, 16 pp., 6 x 9 ins. Illustrated.

Congoleum-Nairn, Inc., 195 Belgrove Drive, Kearny, N. J.

Facts you should know about Resilient Floors. A series of booklets on floors for (1) schools, (2) hospitals, (3) offices, (4) stores, (5) libraries, (6) churches, (7) clubs and lodges, (8) apartments and hotels. Illustrated.

Specifications for Resilient Floors. Booklet, 12 pp. A reprint from Sweet's.

A New Kind of Floor Service. Brochure, 8 pp. Data on Bonded Floors.

Sealex Battleship Linoleum. Booklet, 12 pp. Illustrated. Shows typical installations.

Sealex Treadlite Tiles. Two booklets, 8 and 16 pp. Illustrated.

Colonial Planks. Brochure, 8 pp. Illustrated.

National Lumber Manufacturers' Association, Transportation Building, Washington.

Wood Floors. Booklet. 30 pp., 8½ x 11 ins. Illustrated.

C. Pardee Works, 9 East 45th St., New York, N. Y., and 1600 Walnut St., Philadelphia, Pa.

Pardee Tiles. Bound Volume, 48 pp., 8½ x 11 ins. Illustrated.

Structural Gypsum Corporation, Linden, N. J.

Gypsteel Pre-cast Fireproof Floors. Booklet, 36 pp., 8½ x 11 ins. Illustrated. Data on floorings.

U. S. Gypsum Co., Chicago.

Pyrobar Floor Tile. Folder, 8½ x 11 ins. Illustrated. Data on building floors of hollow tile and tables on floor loading.

U. S. Rubber Co., 1790 Broadway, New York, N. Y.

Period Adaptations for Modern Floors. Brochure, 8 x 11 ins., 60 pp. Richly Illustrated. A valuable work on the use of rubber tile for flooring in interiors of different historic styles.

FURNITURE

American Seating Co., 14 E. Jackson Blvd., Chicago, Ill.

Art Ecclesiastical Booklet, 6 x 9 ins., 48 pp. Illustrations of church fitments in carved wood.

Theatre Chairs. Booklet, 6 x 9 ins., 48 pp. Illustrations of theatre chairs.

Kittinger Co., 1893 Elmwood Ave., Buffalo, N. Y.

Kittinger Club & Hotel Furniture. Booklet, 20 pp., 6¼ x 9½ ins. Illustrated. Deals with fine line of furniture for hotels, clubs, institutions, schools, etc.

Kittinger Club and Hotel Furniture. Booklet, 20 pp., 6 x 9 ins. Illustrated. Data on furniture for hotels and clubs.

A Catalog of Kittinger Furniture. Booklet, 78 pp., 11 x 14 ins. Illustrated. General Catalog.

McKinney Mfg. Co., Pittsburgh, Pa.

Forethought Furniture Plans. Sheets, 6¼ x 9 ins., drawn to ¼-inch scale. An ingenious device for determining furniture arrangement.

GLASS CONSTRUCTION

Adamson Flat Glass Co., Clarksburg, W. Va.

Quality and Dependability. Folder, 2 pp., 8½ x 11 ins. Illustrated. Data in the company's product.

Libbey-Owens Sheet Glass Co., Toledo, Ohio.

Flat Glass. Brochure, 12 pp., 5⅛ x 7⅝ ins. Illustrated. History of manufacture of flat, clear, sheet glass.

GREENHOUSES

King Construction Company, North Tonawanda, N. Y.

King Greenhouses for Home or Estate. Portfolio of half-tone prints, varnishes, 8¼ x 10½ ins.

William H. Lutton Company, 267 Kearney Ave., Jersey City, N. J.

Greenhouses of Quality. Booklet, 50 pp., 8½ x 11 ins. Illustrated. Conservatories making use of Lutton Patented Galvanized Steel V-Bar.

HARDWARE

P. & F. Corbin, New Britain, Conn.

Early English and Colonial Hardware. Brochure, 8½ x 11 ins. An important illustrated work on this type of hardware.

Locks and Builders' Hardware. Bound Volume, 486 pp., 8½ x 11 ins. An exhaustive, splendidly prepared volume.

Colonial and Early English Hardware. Booklet, 48 pp., 8½ x 11 ins. Illustrated. Data on hardware for houses in these styles.

Cutler Mail Chute Company, Rochester, N. Y.

Cutler Mail Chute Model F. Booklet, 4 x 9¼ ins., 8 pp. Illustrated.

HARDWARE—Continued

Richards-Wilcox Mfg. Co., Aurora, Ill.

Distinctive Garage Door Hardware. Booklet, 8½ x 11 ins., 66 pp. Illustrated. Complete information accompanied by data and illustrations on different kinds of garage door hardware.

Distinctive Elevator Door Hardware. Booklet, 90 pp., 10½ x 16 ins. Illustrated.

Russell & Erwin Mfg. Co., New Britain, Conn.

Hardware for the Home. Booklet, 24 pp., 3½ x 6 ins. Deals with residence hardware.

Door Closer Booklet. Brochure, 16 pp., 3½ x 6 ins. Data on a valuable detail.

Garage Hardware. Booklet, 12 pp., 3½ x 6 ins. Hardware intended for garage use.

Famous Homes of New England. Series of folders on old homes and hardware in style of each.

HEATING EQUIPMENT

American Blower Co., 6004 Russell St., Detroit, Mich.

Heating and Ventilating Utilities. A binder containing a large number of valuable publications, each 8½ x 11 ins., on these important subjects.

American Radiator Company, The, 40 West 40th St., N. Y. C.

Ideal Boilers for Oil Burning. Catalog 5½ x 8½ ins., 36 pp. Illustrated in 4 colors. Describing a line of Heating Boilers especially adapted to use with Oil Burners.

Corto—The Radiator Classic. Brochure, 5½ x 8½ ins., 16 pp. Illustrated. A brochure on a space-saving radiator of beauty and high efficiency.

Ideal Arcola Radiator Warmth. Brochure, 6¼ x 9½ ins. Illustrated. Describes a central all-on-one-floor heating plant with radiators for small residences, stores, and offices.

How Shall I Heat My Home? Brochure, 16 pp., 5¾ x 8½ ins. Illustrated. Full data on heating and hot water supply.

New American Radiator Products. Booklet, 44 pp., 5 x 7¾ ins. Illustrated. Complete line of heating products.

A New Heating Problem. Brilliantly Solved. Broadside, 4 pp., 10¾ x 15 ins. Illustrated. Data on the IN-AIRID invisible air valve.

In-Airid, the Invisible Air Valve. Folder, 8 pp., 3½ x 6 ins. Illustrated. Data on a valuable detail of heating.

The 999 ARCO Packless Radiator Valve. Folder, 8 pp., 3½ x 6 ins. Illustrated.

James B. Clow & Sons, 534 S. Franklin St., Chicago, Ill.

Clow Gasteam Vented Heating System. Brochure, 24 pp., 8½ x 11 ins. Illustrated. Deals with a valuable form of heating equipment for using gas.

C. A. Dunham Company, 450 East Ohio St., Chicago, Ill.

Dunham Radiator Trap. Bulletin 101, 8 x 11 ins., 12 pp. Illustrated. Explains working of this detail of heating apparatus.

Dunham Packless Radiator Valves. Bulletin 104, 8 x 11 ins., 8 pp. Illustrated. A valuable brochure on valves.

Dunham Return Heating System. Bulletin 109, 8 x 11 ins. Illustrated. Covers the use of heating apparatus of this kind.

Dunham Vacuum Heating System. Bulletin 110, 8 x 11 ins., 12 pp. Illustrated.

The Dunham Differential Vacuum Heating System. Bulletin 114. Brochure, 12 pp., 8 x 11 ins. Illustrated. Deals with heating for small buildings.

The Dunham Differential Vacuum Heating System. Bulletin 115. Brochure, 12 pp., 8 x 11 ins. Illustrated. Deals with heating for large buildings.

The Fulton Sylphon Company, Knoxville, Tenn.

Sylphon Temperature Regulators. Illustrated brochures, 8½ x 11 ins., dealing with general architectural and industrial applications; also specifically with applications of special instruments.

Sylphon Heating Specialties. Catalog No. 200, 192 pp., 3½ x 6¾ ins. Important data on heating.

Hoffman Specialty Company, Inc., 25 West 45th St., New York, N. Y.

Heat Controlled With the Touch of a Finger. Booklet, 46 pp., 5¾ x 8¾ ins. Illustrated.

How to Lock Out Air, the Heat Thief. Brochure, 48 pp., 5 x 7¼ ins. Illustrated.

Janette Manufacturing Company, 556 West Monroe Street, Chicago.

More Heat from Any Hot Water System on Less Fuel. Folder. 4 pp., 8½ x 11 ins. Illustrated. Deals with use of the "Hydrolator."

S. T. Johnson Co., Oakland, Calif.

Johnson Oil Burners. Booklet, 9 pp., 8½ x 11 ins. Illustrated.

Bulletin No. 4A. Brochure, 8 pp., 8½ x 11 ins. Illustrated. Data on different kinds of oil-burning apparatus.

Bulletin No. 31. Brochure, 8 pp., 8½ x 11 ins. Illustrated. Deals with Johnson Rotary Burner with Full Automatic Control.

Kewanee Boiler Corporation, Kewanee, Ill.

Kewanee on the Job. Catalog, 8½ x 11 ins., 80 pp. Illustrated. Showing installations of Kewanee boilers, water heaters, radiators. etc.

Catalog No. 78, 6 x 9 ins. Illustrated. Describes Kewanee Firebox Boilers with specifications and setting plans.

Catalog No. 79, 6 x 9 ins. Illustrated. Describes Kewanee power boilers and smokeless tubular boilers with specifications.

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SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 188*

HEATING EQUIPMENT—Continued

May Oil Burner Corp., Baltimore, Md.

Adventures in Comfort. Booklet, 24 pp., 6 x 9 ins. Illustrated. Non-technical data on oil as fuel.

Taking the Quest Out of the Question. Brochure, 16 pp., 6 x 9 ins. Illustrated. For home owners interested in oil as fuel.

McQuay Radiator Corporation, 35 East Wacker Drive, Chicago, Ill.

McQuay Visible Type Cabinet Heater. Booklet, 4 pp., 8½ x 11 ins. Illustrated. Cabinets and radiators adaptable to decorative schemes.

McQuay Concealed Radiators. Brochure, 4 pp., 8½ x 11 ins. Illustrated.

McQuay Unit Heater. Booklet, 8 pp., 8½ x 11 ins. Illustrated. Gives specifications and radiator capacities.

Modine Mfg. Co., Racine, Wisc.

Modine Copper Radiation. Booklet, 28 pp. 8½ x 11 ins. Illustrated. Deals with industrial, commercial and domestic heating.

A Few Short Years. Folder. 4 pp. 8½ x 11 ins. Illustrated. Heating for garages.

Dairy Plant Heating. Folder. 4 pp., 8½ x 11 ins. Illustrated.

Industrial Heating. Folder. 4 pp., 8½ x 11 ins. Illustrated.

Modine Unit Heater. Folder. 6 pp., 8½ x 11 ins. Illustrated.

Nash Engineering Company, South Norwalk, Conn.

Bulletin 85. Booklet. 12 pp. 10¾ x 7½ ins. Illustrated in color. Describes construction and operation of the Jennings Return Line Vacuum Heating Pump.

Bulletin 87. Brochure. 8 pp. 10¾ x 7½ ins. Illustrated in color. Deals with Sizes T and U Jennings Vacuum Heating Pump for 2500 and 5000 square feet equivalent direct radiation.

Bulletin 63. Booklet. 4 pp. 10¾ x 7½ ins. Illustrated. Describes in detail the Unit Type Motor Driven Jennings Condensation Pump.

National Radiator Corporation, Johnstown, Pa.

Aero Radiators; Beauty and Worth. Catalog 34. Booklet, 6 x 9 ins., 20 pp., describing and illustrating radiators and accessories.

Six Great Companies Unite to Form a Great Corporation. Booklet, 28 pp., 8½ x 10½ ins. Illustrated. Valuable data on heating.

Prometheus Electric Corporation, 360 West 13th St., New York.

Electric Heating Specialties. Booklet, 24 pages. 8½ x 11 ins. Illustrated. Specialties for heating, cooking, hospitals, organ lofts, etc.

Rome Brass Radiator Corporation, 1 East 42nd Street, New York.

Proof of the Pudding. Booklet, 24 pp., 8½ x 10½ ins. Illustrated. Describes Robras, 20-20 concealed-within-the-walls, lightweight, all-brass radiators.

Within the Walls. Brochure, 16 pp., 4 x 9 ins. Illustrated. Gives facts regarding modern, out-of-sight, lightweight, Robras 20-20 radiators.

Engineering Data. Booklet, 16 pp., 8½ x 10½ ins. Illustrated. Full data and tables to facilitate selection and installation of Robras 20-20 concealed radiators for steam, water and vapor heating systems.

Small Bathrooms Made More Spacious, Brochure, 4 pp. Illustrated. Gives descriptions, sizes and prices of Robras lightweight cabinet radiators to be installed under wash basins.

Sarco Company, Inc., 183 Madison Ave., New York City, N. Y.

Steam Heating Specialties. Booklet, 6 pp., 6 x 9 ins. Illustrated. Data on Sarco Packless Supply Valves and Radiator Traps for vacuum and vapor heating systems.

Equipment Steam Traps and Temperature Regulations. Booklet, 6 pp., 6 x 9 ins. Illustrated. Deals with Sarco Steam Traps for hospital, laundry and kitchen fixtures and the Sarco Self-contained Temperature Regulation for hot water service tanks.

Spencer Heater Co., Williamsport, Pa.

Catalog. Booklet, 20 pp., 6⅛ x 9 ins. Illustrated. Complete line of magazine feed cast iron sectional and steel tubular heaters.

The Fire that Burns Uphill. Brochure, 24 pp., 6⅛ x 9¼ ins. Illustrated in color. Magazine feed heaters for steam, vapor and hot water heating.

B. F. Sturtevant Company, Hyde Park, Boston, Mass.

Tempervane Heating Units. Catalog 363. Booklet, 44 pp., 8½ x 11 ins. Illustrated. Data on "Heating Every Corner with Maximum Economy."

Trane Co., The, La Crosse, Wis.

Bulletin 14, 16 pp., 8½ x 10⅝ ins. Covers the complete line of Trane Heating Specialties, including Trane Bellows Traps, and Trane Bellows Packless Valves.

Bulletin 20. 24 pp., 8½ x 10⅝ ins. Explains in detail the operation and construction of Trane Condensation. Vacuum, Booster, Circulating, and similar pumps.

How to Cut Heating Costs. Booklet, 18 pp., 8½ x 11 ins. Illustrated.

HOISTS, TELESCOPIC

Gillis & Geoghegan, Inc. 535 West Broadway, New York.

G & G Telescopic Hoist. Booklet. 24 pp. 8½ x 11 ins. Illustrated complete data on hoists.

Ash Removal. Folder. 8½ x 11 ins. Illustrated. Hoists for removing ashes from basements.

HOSPITAL EQUIPMENT

The Frink Co., Inc., 369 Lexington Ave., New York City.

Catalog 426. 7 x 10 ins., 16 pp. A booklet illustrated with photographs and drawings, showing the types of light for use in hospitals, as operating table reflectors, linolite and multilite concentrators, ward reflectors, bed lights and microscopic reflectors, giving sizes and dimensions, explaining their particular fitness for special uses.

HOSPITAL EQUIPMENT—Continued

Holophane Company, 342 Madison Avenue, New York.

Lighting Specific for Hospitals. Booklet, 30 pp., 8½ x 11 ins. Illustrated.

The International Nickel Company, 67 Wall St., New York, N. Y.

Hospital Applications of Monel Metal. Booklet, 8½ x 11½ ins., 16 pp. Illustrated. Gives types of equipment in which Monel Metal is used, reasons for its adoption, with sources of such equipment.

Pick-Barth Company, Inc., Albert, 1200 West 35th St., Chicago, and Cooper Square, New York.

Some Thoughts About Hospital Food Service Equipment. Booklet, 22 pp., 7½ x 9¼ ins. Valuable data on an important subject.

Prometheus Electric Corporation, 360 West 13th St., New York.

Electric Heating Specialties. Booklet, 24 pages. 8½ x 11 ins. Illustrated. Specialties for heating, cooking, hospitals, organ lofts, etc.

HOTEL EQUIPMENT

Pick-Barth Company, Inc., Albert, 1200 West 35th St., Chicago, and Cooper Square, New York.

Some Thoughts on Furnishing a Hotel. Booklet, 7½ x 9 ins. Data on complete outfitting of hotels.

INCINERATORS

Home Incinerator Co., Milwaukee, Wis.

The Decent Way. Burn it with Gas. Brochure, 30 pp., 5¼ x 7¼ ins., inside. Illustrated. Incinerator sanitation equipment for residence use.

A. I. A. File, 12 pp., 8¾ x 10¾ ins., inside. Suggestions for architect on incineration, showing installation and equipment.

Specialized Home Comforts Service Plan Book. 40 pp., 8½ x 11 ins., inside. Illustrated. A complete outline of the many advantages of incineration.

Blue Star Standards in Home Building. 16 pp., 5½ x 8½ ins., inside. Illustrated. Explaining fully the Blue Star principles, covering heat, incineration, refrigeration, etc.

Josam Mfg. Co., Michigan City, Ind.

Josam-Graver Incinerators. Folder, 4 pp., 8½ x 11 ins. Illustrated.

Kerner Incinerator Company, 715 E. Water St., Milwaukee, Wis.

Incinerators (Chimney-fed). Catalog No. 15 (Architect and Builders' Edition). Size 8½ x 11 ins., 16 pp. Illustrated. Describes principles and design of Kernerator Chimney-fed Incinerators for residences, apartments, hospitals, schools, apartment hotels, clubs and other buildings. Shows all standard models and gives general information and working data.

Sanitary Elimination of Household Waste. Booklet, 4 x 9 ins. 16 pp. Illustrated. Gives complete information on the Kernerator for residences.

Garbage and Waste Disposal for Apartment Buildings. Folder, 8½ x 11 ins., 16 pp. Illustrated. Describes principle and design of Kernerator Chimney-fed Incinerator for apartments and gives list of buildings where it has been installed.

Sanitary Disposal of Waste in Hospitals. Booklet, 4 x 9 ins., 12 pp. Illustrated. Shows how this necessary part of hospital service is taken care of with the Kernerator. Gives list of hospitals where installed.

The Kernerator (Chimney-fed) Booklet. Catalog No. 17, 20 pp., 8½ x 11 ins. Illustrated. Data on a valuable detail of equipment.

INSULATION

Armstrong Cork & Insulation Co., Pittsburgh, Pa.

The Insulation of Roofs with Armstrong's Corkboard. Booklet. Illustrated. 7½ x 10½ ins., 32 pp. Discusses means of insulating roofs of manufacturing or commercial structures.

Insulation of Roofs to Prevent Condensation. Illustrated booklet, 7½ x 10½ ins., 36 pp. Gives full data on valuable line of roof insulation.

Filing Folder for Pipe Covering Data. Made in accordance with A. I. A. rules.

The Cork-lined House Makes a Comfortable Home. 5 x 7 ins. 32 pp. Illustrated.

Armstrong's Corkboard. Insulation for Walls and Roofs of Buildings. Booklet, 66 pp., 9½ x 11¾ ins. Illustrates and describes use of insulation for structural purposes.

National Lumber Manufacturers' Association, Transportation Building, Washington.

The Cost of Comfort. Booklet. 80 pp., 8½ x 11 ins. Illustrated. A handbook on the economies of dwelling insulation.

Structural Gypsum Corporation, Linden, N. J.

Heat Insulation Value of Gypsteel. Folder, 4 pp., 8½ x 11 ins. Brochure, by Charles L. Norton, of M. I. T.

JOISTS

Bates Expanded Steel Truss Co., East Chicago, Ind.

Catalog No. 4. Booklet, 32 pp., 8½ x 11 ins. Illustrated. Gives details of truss construction with loading tables and specifications.

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Minwax Company, Inc.
11 West 42nd Street, N. Y. C.

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SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 190*

JOISTS—Continued

Concrete Steel Company, 42 Broadway, New York, N. Y.
Structural Economies for Concrete Floors and Roofs. Booklet, 32 pp., 8½ x 11 ins. Illustrated.
Modern Concrete Reinforcement. Brochure, 32 pp., 8½ x 11 ins. Illustrated.
Construction Details for Installing Havemeyer Trusses. Data sheets, 8½ x 11 ins. Illustrated.
Standard Practice for Placing Havemeyer Reinforcement in Columns, Beams and Slabs. Data sheets, 8½ x 11 ins. Illustrated.

KITCHEN EQUIPMENT

The International Nickel Company, 67 Wall St., New York, N. Y.
Hotels, Restaurants and Cafeteria Applications of Monel Metal. Booklet, 8½ x 11 ins., 32 pp. Illustrated. Gives types of equipment in which Monel Metal is used, with service data and sources of equipment.

Prometheus Electric Corporation, 360 West 13th St., New York.
Electric Heating Specialties. Booklet, 24 pages. 8½ x 11 ins. Illustrated. Specialties for heating, cooking, hospitals, organ lofts, etc.

John Van Range Co., Cincinnati.
Practical Planning for Church Food Service. Booklet, 32 pp., 8½ x 11 ins. Illustrated.
Practical Planning for School Service. Booklet, 32 pp., 8½ x 11 ins. Illustrated.

LABORATORY EQUIPMENT

Alberene Stone Co., 153 West 23rd Street, New York City.
Booklet, 8¾ x 11¼ ins., 26 pp. Stone for laboratory equipment, shower partitions, stair treads, etc.

Duriron Company, Dayton, Ohio.
Duriron Acid, Alkali and Rust-proof Drain Pipe and Fittings. Booklet, 8½ x 11 ins., 20 pp. Full details regarding a valuable form of piping.

LANTERNS

Todhunter, Arthur, 119 E. 57th St., New York, N. Y.
Hand-wrought Lanterns. Booklet, 5¼ x 6¾ ins., 20 pp. Illustrated in black and white. With price list. Lanterns appropriate for exterior and interior use, designed from old models and meeting the requirements of modern lighting.

LATH, METAL AND REINFORCING

Milwaukee Corrugating Co., Milwaukee
The Milcor Manual. Booklet, 96 pp., 8½ x 11 ins. Illustrated. Data on metal lath and similar materials.
Milcor Metal Ceiling Catalog. Booklet, 288 pp., 8½ x 11 ins. Illustrated. Data on metal ceiling and wall construction.

National Steel Fabric Co., Pittsburgh, Pa.
Better Walls for Better Homes. Brochure, 16 pp., 7¾ x 11¾ ins. Illustrated. Metal lath, particularly for residences.
Steeltex for Floors. Booklet, 24 pp., 8½ x 11 ins. Illustrated. Combined reinforcing and form for concrete or gypsum floors and roofs.
Steeltex Data Sheet No. 1. Folder, 8 pp., 8½ x 11 ins. Illustrated. Steeltex for floors on steel joists with round top chords.
Steeltex Data Sheet No. 2. Folder, 8 pp., 8½ x 11 ins. Illustrated. Steeltex for floors on steel joists with flat top flanges.
Steeltex Data Sheet No. 3. Folder, 8 pp., 8½ x 11 ins. Illustrated. Steeltex for folders on wood joists.

North Western Expanded Metal Co., 1234 Old Colony Building, Chicago, Ill.
North Western Expanded Metal Products. Booklet, 8½ x 10¾ ins., 20 pp. Fully illustrated, and describes different products of this company, such as Kno-burn metal lath, 20th Century Corrugated. Plasta-saver and longspan lath channels, etc.
Longspan ¾-inch Rib Lath. Folder, 4 pp., 8½ x 11 ins. Illustrated. Deals with a new type of V-Rib expanded metal.
A. I. A. Sample Book. Bound volume, 8½ x 11 ins. Contains actual samples of several materials and complete data regarding their use.
Norwest Metal Lath. Folder, 8½ x 11 ins. Illustrated. Data on Flat Rib Lath.

Truscon Steel Company, Youngstown, Ohio.
Truscon ¾-inch Hy-Rib for Roofs, Floors and Walls. Booklet, 8½ x 11 ins., illustrating Truscon ¾-inch Hy-Rib as used in industrial buildings. Plates of typical construction. Progressive steps of construction. Specification and load tables.

LAUNDRY MACHINERY

Troy Laundry Machinery Co., Inc., 9 Park Place, New York City.
Laundry Machinery for Large Institutions. Loose-Leaf booklet, 50 pp., 8½ x 11 ins. Illustrated.
Laundry Machinery for Small Institutions. Loose-leaf brochure, 50 pp., 8½ x 11 ins. Illustrated.
Accessory Equipment for Institutional Laundries. Leather bound book, 50 pp., 8½ x 11 ins. Illustrated.
Dry Cleaning Equipment for Institutional Purposes. Brochure, 50 pp., 8½ x 11 ins. Illustrated.

LIGHTING EQUIPMENT

The Frink Co., Inc., 369 Lexington Ave., New York, N. Y.
Catalog 415, 8½ x 11 ins., 46 pp. Photographs and scaled cross-sections. Specialized bank lighting, screen and partition reflectors, double and single desk reflectors and Polaralite Signs.

Holophane Company, Inc., 342 Madison Ave., New York, N. Y.
The Lighting of Schools; A Guide to Good Practice. Booklet. 24 pp., 8½ x 11 ins. Illustrated.
Lighting Specifications for Hospitals. Brochure, 30 pp., 8½ x 11 ins. Illustrated.
Industrial Lighting. Bulletin 448A. Booklet, 24 pp., 8½ x 11 ins. Illustrated.
Holophane Catalog. Booklet, 48 pp., 8½ x 11 ins. Combination catalog and engineering data book.
The Lighting of Schools. A Guide to Good Practice. Booklet, 24 pp., 8½ x 11 ins. Illustrated.

Smyser-Royer Co., 1700 Walnut Street, Philadelphia, Pa.
Catalog "J" on Exterior Lighting Fixtures. Brochure, illustrated, giving data on over 300 designs of standards, lanterns and brackets of bronze or cast iron.

Todhunter, 119 East 57th St., New York, N. Y.
Lighting Fixtures, Lamps and Candlesticks. 24 pp., 8½ x 11 ins. Illustrated. Fine assortment of lighting accessories.

Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.
Industrial Lighting Equipment. Booklet, 32 pp., 8½ x 11 ins. Illustrated.
Commercial Lighting. Brochure, 24 pp., 8½ x 11 ins. Illustrated.
Airport and Floodlighting Equipment. Booklet, 20 pp., 8½ x 11 ins. Illustrated.

LUMBER

National Lumber Mfrs. Assn., Washington, D. C.
Use of Lumber on the Farm. Booklet, 38 pp., 8½ x 11 ins. Illustrated.

MAIL CHUTES

Cutler Mail Chute Company, Rochester, N. Y.
Cutler Mail Chute Model F. Booklet, 4 x 9¼ ins., 8 pp. Illustrated.

MANTELS

Henry Klein & Co., Inc. 40-46 West 23rd Street, New York.
Driwood Mantels. Booklet. 12 pp. 8½ x 11 ins. Illustrated. Fine line of eighteenth century English and American mantels.

Arthur Todhunter, 119 E. 57th St., New York, N. Y.
Georgian Mantels. New booklet, 24 pp., 5¾ x 6¼ ins. A fully illustrated brochure on eighteenth century mantels. Folders give prices of mantels and illustrations and prices of fireplace equipment.

MARBLE

The Georgia Marble Company, Tate, Ga.; New York Office, 1328 Broadway.
Why Georgia Marble Is Better. Booklet, 3⅜ x 6 ins. Gives analysis, physical qualities, comparison of absorption with granite, opinions of authorities, etc.
Convincing proof. 3⅜ x 6 ins., 8 pp. Classified list of buildings and memorials in which Georgia Marble has been used, with names of Architects and Sculptors.
Hurt Building, Atlanta; Senior High School and Junior College, Muskegon, Mich. Folders, 4 pp., 8½ x 11 ins. Details.

METALS

Aluminum Company of America, Pittsburgh.
Architectural Aluminum. Brochure, 30 pp., 8½ x 11 ins. Illustrated. An excellent booklet on the subject.

Central Alloy Steel Corporation, Massillon, Ohio.
Sheet Iron Primer. Booklet, 64 pp., 5¼ x 7¾ ins. Illustrated.
The Path to Permanence. Brochure, 52 pp., 8½ x 11 ins. Illustrated. Data on sheet iron.

The International Nickel Company, 67 Wall St., New York N. Y.
Monel Metal Primer. 8 folders, 4 pp., 8½ x 11 ins. Illustrated. Valuable data on use of monel in kitchens, laundries, etc.

MILL WORK—See also Wood

Curtis Companies Service Bureau, Clinton, Iowa.
Architectural Interior and Exterior Woodwork. Standardized Book, 9 x 11½ ins., 240 pp. Illustrated. This is an Architects' Edition of the complete catalog of Curtis Woodwork, as designed by Trowbridge & Ackerman. Contains many color plates.
Better Built Homes. Vols. XV-XVIII, incl. Booklet, 9 x 12 ins., 40 pp. Illustrated. Designs for houses of five to eight rooms, respectively, in several authentic types, by Trowbridge & Ackerman, architects for the Curtis Companies.
Curtis Details. Booklet, 19½ x 23½ ins., 20 pp. Illustrated. Complete details of all items of Curtis woodwork, for the use of architects.
Curtis Cabinet and Stair Work. Booklet, 48 pp., 7¾ x 10½ ins. Illustrated.
Curtis Windows. Brochure, 7¾ x 10½ ins. Illustrated.
Curtis Interior Doors. Booklet, 7¾ x 10½ ins. Illustrated.
Curtis Entrances and Exterior Doors. Brochure, 7¾ x 10½ ins. Illustrated.

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SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 192*

MILL WORK—See also Wood—Continued

Hartmann-Sanders Company, 2155 Elston Ave., Chicago, Ill.
Column Catalog, 7½ x 10 ins., 48 pp. Illustrated. Contains prices on columns 6 to 36 ins. diameter, various designs and illustrations of columns and installations.
The Pergola Catalog. 7½ x 10 ins., 64 pp. Illustrated. Contains illustrations of pergola lattices, garden furniture in wood and cement, garden accessories.

Klein & Co., Inc., Henry, 11 East 37th St., New York, N. Y.
Two Driwood Interiors. Folder, 4 pp., 6¼ x 9 ins. Illustrated. Use of moulding for paneling walls.
A New Style in Interior Decoration. Folder, 4 pp., 6¼ x 9 ins. Illustrated. Deals with interior woodwork.
Driwood Period Mouldings in Ornamented Wood. Booklet, 28 pp., 8½ x 11 ins. Illustrated.
How Driwood Period Mouldings in Ornamented Wood Set a New Style in Decoration. Folder.

Roddis Lumber and Veneer Co., Marshfield, Wis.
Roddis Doors. Brochure, 24 pp., 5¼ x 8½ ins. Illustrated price list of doors for various types of buildings.
Roddis Doors, Catalog G. Booklet, 184 pp., 8½ x 11 ins. Completely covers the subject of doors for interior use.
Roddis Doors for Hospitals. Brochure, 16 pp., 8½ x 11 ins. Illustrated work on hospital doors.
Roddis Doors for Hotels. Brochure, 16 pp., 8½ x 11 ins. Illustrated work on doors for hotel and apartment buildings.

MORTAR AND CEMENT COLORS

Clinton Metallic Paint Co., Clinton, N. Y.
Clinton Mortar Colors. Folder, 8½ x 11 ins., 4 pp. Illustrated in colors, gives full information concerning Clinton Mortar Colors with specific instructions for using them.
Color Card. 3¼ x 6½ ins. Illustrates in color the ten shades in which Clinton Mortar Colors are manufactured.
Something New in Stucco. Folder, 3½ x 6 ins. An interesting folder on the use of coloring matter for stucco coated walls.

ORNAMENTAL PLASTER

Jacobson & Co., 241 East 44th St., New York, N. Y.
A Book of Old English Designs. Brochure, 47 plates, 12 x 9 ins. Deals with a fine line of decorative plaster work.
Architectural and Decorative Ornaments. Cloth bound volume, 184 pp., 9 x 12 ins. 18 plates. Price, $3.00. A general catalog of fine plaster ornaments.
Geometrical ceilings. Booklet, 23 plates, 7 x 9 ins. An important work on decorative plaster ceilings.

PAINTS, STAINS, VARNISHES AND WOOD FINISHES

Minwax Company, Inc., 11 West 42nd St., New York.
Color Card and Specifications for Minwax Brick and Cement Coating. Folder, 4 pp., 8½ x 11 ins. Illustrated.

National Lead Company, 111 Broadway, New York, N. Y.
Handy Book on Painting. Book, 5½ x 3¼ ins., 100 pp. Gives directions and formulæ for painting various surfaces of wood, plaster, metals, etc., both interior and exterior.
Red Lead in Paste Form. Booklet. 6¼ x 3½ ins., 16 pp. Illustrated. Directions and formulæ for painting metals.
Came Lead. Booklet, 6 x 8¾ ins., 12 pp. Illustrated. Describes various styles of lead cames.

Pratt & Lambert, Inc., Buffalo, N. Y.
Specification Manual for Paint, Varnishing and Enameling. Booklet, 38 pp., 7½ x 10⅝ ins. Complete specifications for painting, varnishing and enameling interior and exterior wood, plaster, and metal work.

Sherwin-Williams Company, 601 Canal Rd., Cleveland, Ohio.
Complete Architectural Specifications for painting, varnishing and lacquering, reprinted from the Sherwin-Williams Architectural Catalogue as it appears in Sweet's Architectural Catalogue. Form Number B 303. 8½ x 11, bound in paper, thirty pages of specifications and color chips; carries A. I. A. file number.

Sonneborn Sons, Inc., L., Dept. 4, 116 Fifth Ave., New York. N. Y.
Paint Specifications. Booklet, 8½ x 10¾ ins., 4 pp.

Toch Brothers, New York, Chicago, Los Angeles.
Architects' Specification Data. Sheets in loose leaf binder, 8½ x 11 ins., dealing with an important line of materials.

U. S. Gutta Percha Paint Co., Providence, R. I.
Barreled Sunlight. Booklet, 8½ x 11 ins. Data on "Barreled Sunlight" with specifications for its use.

PARCEL DELIVERY DEVICES

Receivador Sales Company, Grand Rapids, Mich.
Architects' Portfolio. Booklet, 12 pp., 8½ x 11 ins. Illustrated. Deals with delivery problems and their solution.

PARTITIONS

Circle A. Products Corporation, New Castle, Ind.
Circle A. Partitions Sectional and Movable. Brochure. Illustrated. 8½ x 11¼ ins., 32 pp. Full data regarding an important line of partitions, along with Erection Instructions for partitions of three different types.

Dahlstrom Metallic Door Company, Jamestown, N. Y.
Dahlstrom Standard Steel Partitions. Booklet, 24 pp., 8½ x 11 ins. Illustrated.

Irving Hamlin, Evanston, Ill.
Hamlinized Folding Partitions Made from Hamlin's Evanston Soundproof Doors, Sectional and Movable. Folder, 4 pp., 8½ x 11 ins. Illustrated.

Hauserman Company, E. F., Cleveland, Ohio.
Hollow Steel Standard Partitions. Various folders, 8½ x 11 ins. Illustrated. Give full data on different types of steel partitions, together with details, elevations and specifications.

Henry Klein & Co., 25 Grand Street, Elmhurst, L. I., N. Y.
Telesco Partition. Catalog, 8¾ x 11 ins., 14 pp. Illustrated. Shows typical offices laid out with Telesco partitions, cuts of finished partition units in various woods. Gives specifications and cuts of buildings using Telesco.
Detailed Instructions for Erecting Telesco Partitions. Booklet, 24 pp., 8½ x 11 ins. Illustrated. Complete instructions, with cuts and drawings, showing how easily Telesco Partition can be erected.

Improved Office Partition Co., 25 Grand St., Elmhurst, L. I., N. Y. (See Henry Klein & Co.)

Richards-Wilcox Mfg. Co., Aurora, Ill.
Partitions. Booklet, 7 x 10 ins., 32 pp. Illustrated. Describes complete line of track and hangers for all styles of sliding parallel, accordion and flush-door partitions.

Telesco Office Partition, 25 Grand St., Elmhurst, L. I., N. Y. (See Henry Klein & Co.)

U. S. Gypsum Co., Chicago, Ill.
Pyrobar Partition and Furring Tile. Booklet, 8¼ x 11 ins., 24 pp. Illustrated. Describes use and advantages of hollow tile for inner partitions.

PIPE

American Brass Company, Waterbury, Conn.
Bulletin B-1. Brass Pipe for Water Service. 8¼ x 11 ins., 28 pp. Illustrated. Gives schedule of weights and sizes (I.P.S.) of seamless brass and copper pipe, shows typical installations of brass pipe, and gives general discussion of the corrosive effect of water on iron, steel and brass pipe.

American Rolling Mill Company, Middletown, Ohio.
How ARMCO Dredging Products Cut Costs. Booklet, 16 pp., 6 x 9 ins. Data on dredging pipe.

Clow & Sons, James B., 534 S. Franklin St., Chicago, Ill.
Catalog A. 4 x 16½ ins., 700 pp. Illustrated. Shows a full line of steam, gas and water works supplies.

Cohoes Rolling Mill Company, Cohoes, N. Y.
Cohoes Pipe Handbook. Booklet, 40 pp., 5 x 7½ ins. Data on wrought iron pipe.

Duriron Company, Dayton, Ohio.
Duriron Acid, Alkali, Rust-proof Drain Pipe and Fittings. Booklet, 20 pp., 8½ x 11 ins. Illustrated. Important data on a valuable line of pipe.

National Tube Co., Frick Building, Pittsburgh, Pa.
"National" Bulletin No. 2. Corrosion of Hot Water Pipe, 8½ x 11 ins., 24 pp. Illustrated. In this bulletin is summed up the most important research dealing with hot water systems. The text matter consists of seven investigations by authorities on this subject.
"National" Bulletin No. 3. The Protection of Pipe Against Internal Corrosion, 8½ x 11 ins., 20 pp. Illustrated. Discusses various causes of corrosion, and details are given of the deactivating and deareating systems for eliminating or retarding corrosion in hot water supply lines.
"National" Bulletin No. 25. "National" Pipe in Large Buildings. 8½ x 11 ins., 88 pp. This bulletin contains 254 illustrations of prominent buildings of all types, containing "National" Pipe, and considerable engineering data of value to architects, engineers, etc.
Modern Welded Pipe. Book of 88 pp., 8½ x 11 ins., profusely illustrated with halftone and line engravings of the important operations in the manufacture of pipe.

PLASTER

Best Bros. Keene's Cement Co., Medicine Lodge, Kans.
Information Book. Brochure, 24 pp., 5 x 9 ins. Lists grades of plaster manufactured; gives specifications and uses for plaster.
Plasterers' Handbook. Booklet, 16 pp., 3½ x 5½ ins. A small manual for use of plasterers.

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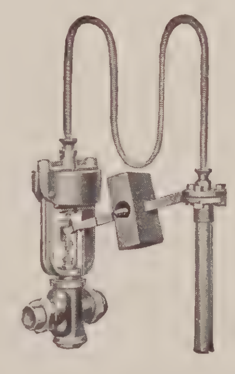

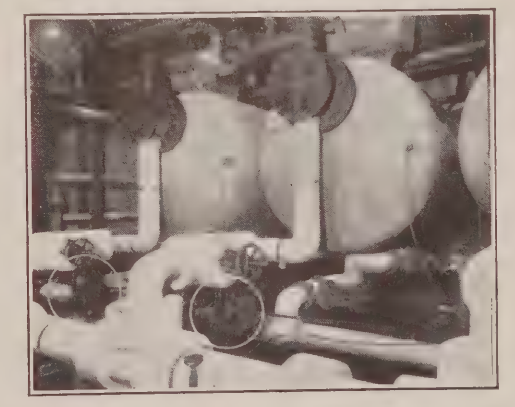

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SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 194*

PLASTER—Continued

Interior Walls Everlasting. Brochure, 20 pp., 6¼ x 9¼ ins. Illustrated. Describes origin of Keene's Cement and views of buildings in which it is used.

PLUMBING EQUIPMENT

Clow & Sons, James B., 534 S. Franklin St., Chicago, Ill.

Catalog M. 9¼ x 12 ins., 184 pp. Illustrated. Shows complete line of plumbing fixtures for Schools, Railroads and Industrial Plants.

Crane Company, 836 S. Michigan Ave., Chicago, Ill.

Plumbing Suggestions for Home Builders. Catalog, 3 x 6 ins., 80 pp. Illustrated.

Plumbing Suggestions for Industrial Plants. Catalog, 4 x 6½ ins., 34 pp. Illustrated.

Planning the Small Bathroom. Booklet, 5 x 8 ins. Discusses planning bathrooms of small dimensions.

John Douglas Co., Cincinnati, Ohio.

Douglas Plumbing Fixtures. Bound volume, 200 pp., 8½ x 11 ins. Illustrated. General catalog.

Another Douglas Achievement. Folder, 4 pp., 8½ x 11 ins. Illustrated. Data on new type of stall.

Hospital. Brochure, 60 pp., 8½ x 11 ins. Illustrated. Deals with fixtures for hospitals.

Duriron Company, Dayton, Ohio.

Duriron Acid, Alkali and Rust-Proof Drain Pipe and Fittings. Booklet, 8½ x 11 ins., 20 pp. Full details regarding a valuable form of piping.

Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago, Ill.

Watrous Patent Flush Valves, Duojet Water Closets, Liquid Soap Fixtures, etc. 8½ x 11 ins., 136 pp., loose-leaf catalog, showing roughing-in measurements, etc.

Maddock's Sons Company, Thomas, Trenton, N. J.

Catalog K. Booklet, 150 pp., 8½ x 10⅞ ins. Illustrated. Data on vitreous china plumbing fixtures with brief history of Sanitary Pottery.

Speakman Company, Wilmington, Del.

Catalog K. Booklet, 150 pp., 8½ x 10⅞ ins. Illustrated. Data on showers and equipment details.

Trenton Potteries Company, Trenton, N. J.

The Blue Book of Plumbing. Bound volume, 182 pp., 8½ x 10½ ins. Illustrated.

PNEUMATIC TUBE SYSTEMS

G & G Atlas Systems, Inc., 544 West Broadway, New York.

12 pp., 8½ x 11. Illustrated booklet of tube systems for retail stores and other buildings.

4 pp., 8½ x 11. Data Sheet showing schematic diagrams for hotel, bank, factory and wholesale buildings, table of sizes, space requirements and preliminary layout steps. A. I. A. 35h21.

PUMPS

Kewanee Private Utilities Co., 442 Franklin St., Kewanee, Ill.

Bulletin E. 7¾ x 10¼ ins., 32 pp. Illustrated. Catalog. Complete descriptions, with all necessary data, on Standard Service Pumps, Indian Brand Pneumatic Tanks, and Complete Water Systems, as installed by Kewanee Private Utilities Co.

Nash Engineering Company, South Norwalk, Conn.

Bulletin 52. Brochure. 6 pp., 10½ x 7¾ ins. Illustrated in color. Devoted to Jennings Standard Centrifugal Pumps for house service, boosting city water pressure to supply top stories, for circulating warm water, etc.

Bulletin 97. Booklet. 16 pp., 10½ x 7¾ ins. Illustrated in color. Describes the design, construction and operation of the Jennings Suction Sump Pump.

Bulletin 11. Brochure. 8 pp., 10½ x 7¾ ins. Illustrated in color. Deals with Nash Hytor Vacuum Pumps for air and gases.

The Trane Co., La Crosse, Wis.

Trane Small Centrifugal Pumps. Booklet, 3¾ x 8 ins., 16 pp. Complete data on an important type of pump.

RAMPS

Ramp Buildings Corporation, 21 East 40th St., New York, N. Y.

Building Garages for Profitable Operation. Booklet, 8½ x 11 ins. 16 pp. Illustrated. Discusses the need for modern mid-city, parking garages, and describes the d'Humy Motoramp system of design, on the basis of its superior space economy and features of operating convenience. Gives cost analyses of garages of different sizes, and calculates probable earnings.

Garage Design Data. Series of informal bulletins issued in loose-leaf form, with monthly supplements.

REFRIGERATION

The Fulton Syphon Company, Knoxville, Tenn.

Temperature Control of Refrigeration Systems. Booklet, 8 pp., 8½ x 11 ins. Illustrated. Deals with cold storage, chilling of water, etc.

North Western Expanded Metal Company, Chicago, Ill.

Designing Data. Book, 6 x 9 ins., 96 pp. Illustrated. Covers the use of Econo Expanded Metal for various types of reinforced concrete construction.

REINFORCED CONCRETE—See also Construction, Concrete

North Western Expanded Metal Company, Chicago, Ill.

Longspan ¾-inch Rib Lath. Folder, 4 pp., 8½ x 11 ins. Illustrated. Deals with a new type of V-Rib expanded metal.

Truscon Steel Company, Youngstown, Ohio.

Shearing Stresses in Reinforced Concrete Beams. Booklet, 8½ x 11 ins., 12 pp.

RESTAURANT EQUIPMENT

John Van Range Company, Cincinnati.

Planning Restaurants That Make Money. Booklet, 78 pp., 8½ x 11 ins. Illustrated. Excellent work on equipment.

ROOFING

The Barrett Company, 40 Rector St., New York City.

Architects' and Engineers' Built-up Roofing Reference Series; Volume IV Roof Drainage System. Brochure, 64 pp., 8½ x 11¼ ins. Gives complete data and specifications for many details of roofing.

Federal Cement Tile Co., 608 S. Dearborn Street, Chicago.

Catalog and Roof Standards. Booklet, 36 pp. 8½ x 11 ins. Illustrated. Describes Featherweight Concrete Insulating Roof Slabs, including complete data, weights and dimensions, specifications and detail drawings. Also includes complete information on Featherweight Nailing Concrete Roof Slabs for use with ornamented slate or copper covering. The catalog is profusely illustrated and contains also a partial list of users.

Examples of Theaters and Theater Roofs. Brochure, 16 pps., 8½ x 11 ins., Illustrated. Contains views of theaters designed by some of the country's leading architects.

Federal Interlocking Tile and Glass Tile. 4 pp., 8½ x 11 ins. Illustrates and describes complete roof or precast concrete slabs requiring no composition covering.

Heinz Roofing Tile Co., 1925 West Third Avenue, Denver, Colo.

Plymouth-Shingle Tile with Sprocket Hips. Leaflet, 8½ x 11 ins. Illustrated. Shows use of English shingle tile with special hips.

Italian Promenade Floor Tile. Folder, 2 pp., 8½ x 11 ins. Illustrated. Floor tiling adapted from that of Davanzati Palace.

Mission Tile. Leaflet, 8½ x 11 ins. Illustrated. Tile such as are used in Italy and Southern California.

Georgian Tile. Leaflet, 8½ x 11 ins. Illustrated. Tiling as used in old English and French farmhouses.

Johns-Manville Corporation, New York.

The New Book of Roofs. Brochure, 24 pp., 8½ x 11 ins. Illustrated. Roofing from the Architect's point of view.

Ludowici-Celadon Company, 104 So. Michigan Ave., Chicago, Ill.

"Ancient" Tapered Mission Tiles. Leaflet, 8½ x 11 ins., 4 pp. Illustrated. For architects who desire something out of the ordinary this leaflet has been prepared. Describes briefly the "Ancient" Tapered Mission Tiles, hand-made with full corners and designed to be applied with irregular exposures.

Milwaukee Corrugating Co., Milwaukee.

Milcor Architectural Sheet Metal Guide. Booklet. 72 pp., 8½ x 11 ins. Illustrated. Metal tile roofing, skylights, ventilators, etc.

Milcor Sheet Metal Handbook. Brochure. 128 pp., 8½ x 11 ins. Illustrated. Deals with rain-carrying equipment, etc.

Structural Gypsum Corporation, Linden, N. J.

Relative Effectiveness of Various Types of Roofing Construction in Preventing Condensation of the Under Surface. Folder, 4 pp., 8¾ x 11 ins. Important data on the subject.

Gypsteel Pre-cast Fireproof Roofs. Booklet, 48 pp., 8½ x 11 ins. Illustrated. Information regarding a valuable type of roofing.

U. S. Gypsum Co., Chicago, Ill.

Pyrobar Roof Construction. Booklet, 8 x 11 ins., 48 pp. Illustrated. Gives valuable data on the use of tile in roof construction.

Sheetrock Pyrofill Roof Construction. Folder, 8½ x 11 ins. Illustrated. Covers use of roof surfacing which is poured in place.

SCHOOL EQUIPMENT

John Van Range Co., Cincinnati.

Practical Planning for School Service. Booklet, 32 pp., 8½ x 11 ins. Illustrated.

SEWAGE DISPOSAL

Kewanee Private Utilities, 442 Franklin St., Kewanee, Ill.

Specification Sheets. 7¾ x 10¼ ins., 40 pp. Illustrated. Detailed drawings and specifications covering water supply and sewage disposal systems.

Nash Engineering Company, South Norwalk, Conn.

Bulletin 67. Booklet. 16 pp. 10¾ x 7½ ins. Illustrated in color. Describes Type A Jennings Sewage Ejector for handling Unscreened sewage and raising it from basements below sewer level.

Bulletin 103. Brochure. 16 pp. 10¾ x 7½ ins. Illustrated in color. Deals with small size Type B Jennings Sewage Ejector.

SCREENS

American Brass Co., The, Waterbury, Conn.

Facts for Architects About Screening. Illustrated folder, 9½ x 11¾ ins., giving actual samples of metal screen cloth and data on fly screens and screen doors.

REQUEST FOR CATALOGS

To get any of the catalogs described in this section, put down the title of the catalog desired, the name of the manufacturer and send coupon to THE ARCHITECTURAL FORUM, 521 Fifth Avenue, New York.

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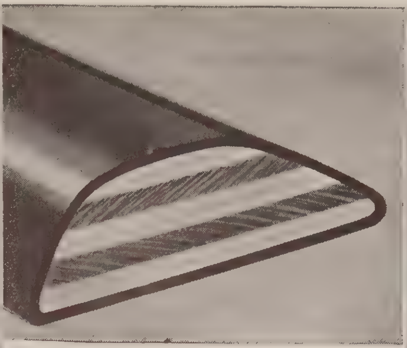
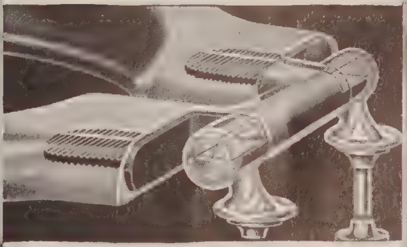
Racing Spars...and Whale-bone-ite



Note the Laminated Construction—a core of alternating-grain layers of hardwood—sealed and bonded to the whole by Whale-bone-ite. It is warp-proof and is guaranteed against warping, cracking and splitting.



The Whale-bone-ite steel hinge is moulded integral with the Seat forming an unbreakable unit. Covered with Whale-bone-ite, the hinge is as handsome as the Seat. It cannot tarnish. It is easy to clean.

Same *laminated* construction...Same shock-defying strength

Racing yachts—how they pile on the canvas—what a terrific strain for the spars to stand! The secret of their immense defiance is in their LAMINATED construction.

It's the secret of Whale-bone-ite strength also, the reason Whale-bone-ite can stand the slam-bang abuse of the careless public—can be guaranteed for the life of the building—can immediately end all replacement expense.

We and others have tried to make toilet seats as strong, as light and as sanitary by other methods. But it can't be done. *Only laminated* construction can give the abuse-defying strength of Whale-bone-ite—the careless abuse that every public toilet seat receives. Fourteen years and a million Whale-bone-ites in use have proved it. Today, nearly all seats going into public toilets are of laminated construction.

Whale-bone-ite Seats are found quite generally in the guest bathroom of fine hotels as well as in public institutions where service requirements are severe. Many new apartment houses are equipping all toilets with them.

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WHALE·BONE·ITE
TOILET SEATS

The Brunswick-Balke-Collender Co.
623 South Wabash Avenue, Chicago

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Birmingham
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Cleveland
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Milwaukee
Minneapolis
Nashville
Newark
New Haven
New Orleans
New York
Philadelphia
Pittsburgh
Richmond
San Antonio
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St. Louis
Tampa
Washington
Montreal
Ottawa
Toronto
Havana
Buenos Aires
Adelaide, Australia
Sidney, Australia
Johannesburg, South Africa

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 196*

SCREENS—Continued

Athey Company, 6015 West 65th St., Chicago, Ill.
The Athey Perennial Window Shade. An accordion pleated window shade, made from translucent Herringbone woven Coutil cloth, which raises from the bottom and lowers from the top. It eliminates awnings, affords ventilation, can be dry-cleaned and will wear indefinitely.

Orange Screen Co., Maplewood, N. J.
Orsco Aluminum Screens. Booklet, 8 pp., 8 x 11 ins. Illustrated. Data on a valuable line of screens.
Orsco Screens and Other Products. Brochure, 20 pp., 8 x 11 ins. Illustrated. Door and window screens and other hardware.

SHADE CLOTH AND ROLLERS

Columbia Mills, Inc., 225 Fifth Avenue, New York, N. Y.
Window Shade Data Book. Folder, 28 pp., 8½ x 11 ins. Illustrated.

SHELVING-STEEL

David Lupton's Sons Company, Philadelphia, Pa.
Lupton Steel Shelving. Catalog E. Illustrated brochure, 40 pp., 8⅝ x 11 ins. Deals with steel cabinets, shelving, racks, doors, partitions, etc.

STEEL PRODUCTS FOR BUILDING

Bethlehem Steel Company, Bethlehem, Pa.
Steel Joists and Stanchions. Booklet, 72 pp., 4 x 6¾ ins. Data for steel for dwellings, apartment houses, etc.

Steel Frame House Company, Pittsburgh, Pa. (Subsidiary of McClintic-Marshall Corp.)
Steel Framing for Dwellings. Booklet, 16 pp., 8½ x 11 ins. Illustrated.
Steel Framing for Gasoline Service Stations. Brochure, 8 pp., 8½ x 11 ins. Illustrated.
Steel Frame Standard Gasoline Service Stations. Booklet, 8 pp., 8½ x 11 ins. Illustrated. Three standard designs of stations.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
The Arc Welding of Structural Steel. Brochure, 32 pp., 8½ x 11 ins. Illustrated. Deals with an important structural process.

STONE, BUILDING

Indiana Limestone Company, Bedford, Ind.
Volume 3, Series A-3. Standard Specifications for Cut Indiana Limestone work, 8½ x 11 ins., 56 pp. Containing specifications and supplementary data relating to the best methods of specifying and using this stone for all building purposes.
Volume 1. Series B. Indiana Limestone Library, 6 x 9 ins., 36 pp. Illustrated. Giving general information regarding Indiana Limestone, its physical characteristics, etc.
Volume 4. Series B. Booklet. New Edition, 8½ x 11 ins., 64 pp. Illustrated. Indiana Limestone as used in Banks.
Volume 5. Series B. Indiana Limestone Library. Portfolio, 11⅛ x 8¾ ins. Illustrated. Describes and illustrates the use of stone for small houses with floor plans of each.
Volume 6. Series B. Indiana Limestone School and College Buildings. 8½ x 11 ins., 80 pp. Illustrated.
Volume 12. Series B. Distinctive Homes of Indiana Limestone. 8½ x 11 ins., 48 pp. Illustrated.
Old Gothic Random Ashlar. 8½ x 11 ins., 16 pp. Illustrated.

STORE FRONTS

Brasco Manufacturing Co., 5025-35 South Wabash Ave., Chicago, Ill.
Catalog No. 33. Series 500. All-Metal Construction. Brochure, 20 pp., 8½ x 11 ins. Illustrated. Deals with store fronts of a high class.
Catalog No. 34. Series 202. Standard construction. Booklet, 16 pp. 8½ x 11 ins. Illustrated, complete data on an important type of building.
Detail Sheets. Set of seven sheets, 8½ x 11 ins., printed on tracing paper, giving full-sized details and suggestions for store front designs.
Davis Solid Architectural Bronze Sash. Set of six sheets, 8½ x 11 ins., printed on tracing paper. Full-sized details and suggestions for designs of special bronze store front construction.

The Kawneer Company, Niles, Mich.
Catalog M, 1929 Edition, 64 pages, 8½ x 11 ins., with the A.I.A. File No., profusely illustrated. General Catalog.
Detail Sheet and descriptive folder, 8½ x 11 ins., with A.I.A. File No. featuring "B" Store Front Construction, designed along modernistic lines.

STORE FRONTS—Continued

Modern Bronze Store Front Co., Chicago Heights, Ill.
Introducing Extruded Bronze Store Front Construction. Folder, 4 pp., 8½ x 11 ins. Illustrated. Contains full-sized details of metal store fronts.

Zouri Drawn Metals Company, Chicago Heights, Ill.
Zouri Safety Key-Set Store Front Construction. Catalog, 8¼ x 10½ ins., 60 pp. Illustrated. Complete information with detailed sheets and installation instructions convenient for architects' files.
International Store Front Construction. Catalog, 8¼ x 10 ins., 70 pp. Illustrated. Complete information with detailed sheets and installation instructions convenient for architects' files.
Store Fronts by Zouri. Booklet, 30 pp., 9 x 12 ins. Illustrated.

TELEPHONE SERVICE ARRANGEMENTS

All Bell Telephone Companies. Apply nearest Business Office, or American Telephone and Telegraph Company, 195 Broadway, New York.
Planning for Home Telephone Conveniences. Booklet, 52 pp., 8½ x 11 inches. Illustrated.
Planning for Telephones in Buildings. Brochure, 74 pp., 8½ x 11 inches. Illustrated.

TERRA COTTA

National Terra Cotta Society, 19 West 44th St., New York, N. Y.
Standard Specifications for the Manufacture, Furnishing and Setting of Terra Cotta. Brochure, 8½ x 11 ins., 12 pp. Complete Specification, Glossary of Terms Relating to Terra Cotta and Short Form Specification for incorporating in Architects' Specification.
Color in Architecture. Revised Edition. Permanently bound volume, 9⅛ x 12¼ ins., containing a treatise upon the basic principles of color in architectural design, illustrating early European and modern American examples. Excellent illustrations in color.
Present Day Schools. 8½ x 11 ins., 32 pp. Illustrating 42 examples of school architecture with article upon school building design by James O. Betelle, A. I. A.
Better Banks. 8½ x 11 ins., 32 pp. Illustrating many banking buildings in terra cotta with an article on its use in bank design by Alfred C. Bossom, Architect.

TILE, HOLLOW

National Fire-Proofing Co., 250 Federal Street, Pittsburgh, Pa.
Natco. The Complete line of Structural Clay Tile. Booklet. 39 pp. 8½ x 11 ins. Illustrated. A General Catalog.
Natco Double Shell Load Bearing Tile Bulletin. 8½ x 11 ins., 6 pp. Illustrated.
Natco Header Backer Tile Bulletin. 8½ x 11 ins., 4 pp. Illustrated.
Natco Face Tile for the Up-to-Date. Farm Bulletin. 8½ x 11 ins.
Natco Unibacker Tile Bulletin. 8½ x 11 ins., 4 pp. Illustrated.
Natcoflor Bulletin. 8½ x 11 ins., 6 pp. Illustrated.

TILES

Hanley Company, Bradford, Pa.
Hanley Quarry Tile. Folder. 4 pp., 5 x 8 ins. Illustrated.

C. Pardee Works, 9 East 45th St., New York, N. Y., and 1600 Walnut St., Philadelphia, Pa.
Pardee Tiles. Bound volume, 48 pp., 8½ x 11 ins. Illustrated.

United States Quarry Tile Co., Parkersburg, W. Va.
Quarry Tiles for Floors. Booklet, 120 pp., 8½ x 11 ins. Illustrated. General catalog. Details of patterns and trim for floors.
Art Portfolio of Floor Designs. 9¼ x 12¼ ins. Illustrated in colors. Patterns of quarry tiles for floors.

VALVES

Crane Co., 836 S. Michigan Ave., Chicago, Ill.
No. 51. General Catalog. Illustrated. Describes the complete line of the Crane Co.

C. A. Dunham Co., 450 East Ohio St., Chicago, Ill.
The Dunham Packless Radiator Valve. Brochure, 12 pp., 8 x 11 ins. Illustrated. Data on an important type of valve.

Jenkins Brothers, 80 White Street, New York.
Office Buildings Yesterday and Today. Folder, 8½ x 11 ins. Illustrated. Valves for use in office buildings.
The Valve Behind a Good Heating System. Booklet, 4½ x 7¼ ins., 16 pp. Color plates. Description of Jenkins Radiator Valves for steam and hot water, and brass valves used as boiler connections.
Jenkins Valves for Plumbing Service. Booklet, 4½ x 7¼ ins. 16 pp. Illustrated. Description of Jenkins Brass Globe, Angle Check and Gate Valves commonly used in home plumbing, and Iron Body Valves used for larger plumbing installations.

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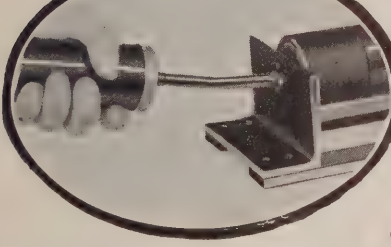

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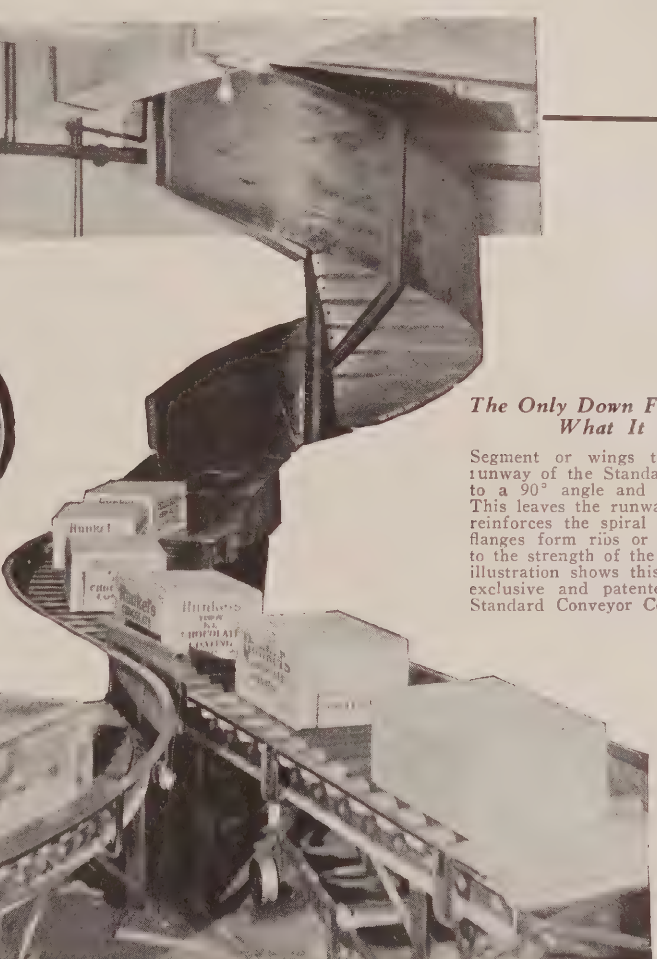

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SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 198*

VENETIAN BLINDS

Burlington Venetian Blind Co., Burlington, Vt.
Venetian Blinds. Booklet, 7 x 10 ins., 24 pp. Illustrated. Describes the "Burlington" Venetian blinds, method of operation, advantages of installation to obtain perfect control of light in the room.

Columbia Mills, Inc., 225 Fifth Ave., New York.
Columbia Venetian Blinds. Booklet, 6 pp., 8½ x 11 ins. Illustrated. Complete data and specifications.

VENTILATION

American Blower Co., Detroit, Mich.
American H. S. Fans. Brochure, 28 pp., 8½ x 11 ins. Data on an important line of blowers.

Duriron Company, Dayton, Ohio.
Acid-proof Exhaust Fans. Folder, 8 x 10½ ins., 8 pp. Data regarding fans for ventilation of laboratory fume hoods.
Specification Form for Acid-proof Exhaust Fans. Folder, 8 x 10½ ins.

Staynew Filter Corporation, Rochester, N. Y.
Protectomotor High Efficiency Industrial Air Filters. Booklet, 20 pp., 8½ x 11 ins. Illustrated. Data on valuable detail of apparatus.

WATERPROOFING

Master Builders Company, Cleveland, Ohio.
Waterproofing and Dampproofing and Allied Products. Sheets in loose index file, 9 x 12 ins. Valuable data on different types of materials for protection against dampness.
Waterproofing and Dampproofing File. 36 pp. Complete descriptions and detailed specifications for materials used in building with concrete.

Minwax Company, Inc., 11 West 42nd St., New York.
Waterproofing Stadia. Folder, 4 pp., 8½ x 11 ins. Illustrated.
Transparent Waterproofings for All Masonry Walls and Surfaces. Folder, 4 pp., 8½ x 11 ins. Illustrated.
Data Sheet on Membrane Waterproofing. Folder, 4 pp., 8½ x 11 ins. Illustrated.

Sommers & Co., Ltd., 342 Madison Ave., New York, N. Y.
"Permantile Liquid Waterproofing" for making concrete and cement mortar permanently impervious to water. Also circulars on floor treatments and cement colors. Complete data and specifications. Sent upon request to architects using business stationery. Circular size, 8½ x 11 ins.

Sonneborn Sons, Inc., L., 116 Fifth Ave., New York, N. Y.
Pamphlet, 3¾ x 8¾ ins., 8 pp. Explanation of waterproofing principles. Specifications for waterproofing walls, floors, swimming pools and treatment of concrete, stucco and mortar.

Toch Brothers, New York, Chicago, Los Angeles.
Architects' Specification Data. Sheets in loose leaf binder, 8½ x 11 ins., dealing with an important line of materials.

WEATHER STRIPS

Athey Company, 6035 West 65th St., Chicago, Ill.
The Only Weatherstrip with a Cloth to Metal Contact. Booklet, 16 pp., 8½ x 11 ins. Illustrated. Data on an important type of weather stripping.

WINDOWS

Detroit Steel Products Co., 2250 E. Grand Boulevard, Detroit.
Fenestra Blue Book. Brochure, 75 pp., 8½ x 11 ins. Illustrated. Data on steel windows.

The Kawneer Company, Niles, Mich.
Circular, 8½ x 11 with A.I.A. File No. featuring full size details and specifications of Heavy Type Sealair Independent Balanced Sash Window.
Circular, 8½ x 11 with A.I.A. File No. featuring full size details and specifications of Light Independent Balanced Sash Sealair Windows.
Circular, 8½ x 11 with A.I.A. File No. featuring full size details and specifications of In-swinging Sash Sealair Windows. The above to be furnished in non-ferrous metal and steel.

David Lupton's Sons Company, Philadelphia, Pa.
Lupton Pivoted Sash. Catalog 12-A. Booklet, 48 pp., 8⅝ x 11 ins. Illustrates and describes windows suitable for manufacturing buildings.
Lupton Commercial Projected Windows. Brochure. 24 pp., 8½ x 11 ins. Illustrated. Details and specifications.

WINDOWS, CASEMENT

Detroit Steel Products Co., 2250 E. Grand Boulevard, Detroit.
Fenestra Casements. Booklet, 14 pp., 8½ x 11 ins. Illustrated. Discusses casements, particularly for residences.
Fenestra Screen Casements. Brochure, 16 pp., 8½ x 11 ins. Illustrated.
Decorating With Casements. Booklet, 18 pp., with inserts in color 6 x 8½ ins. Deals with use of decorations, particularly draperies, with casement windows.

WINDOWS, CASEMENT—Continued

Hope & Sons, Henry, 103 Park Ave., New York, N. Y.
Catalog, 12¼ x 18½ ins., 30 pp. Illustrated. Full-size details of outward and inward opening casements.

David Lupton's Sons Company, Philadelphia, Pa.
Lupton Casement of Copper Steel. Catalog C-217. Booklet, 24 pp., 8⅝ x 11 ins. Illustrated brochure on casements, particularly for residences.
Lupton Creates a Complete Casement. Folder, 8½ x 11 ins. Illustrated data on a casement providing for screens, shades and draperies.
Lupton Heavy Casements. Detail Sheet No. 101, 4 pp., 8½ x 11 ins. Details and specifications only.

Richards-Wilcox Mfg. Co., Aurora, Ill.
Casement Window Hardware. Booklet, 24 pp., 8½ x 11 ins. Illustrated. Shows typical installations, detail drawings, construction details, blue-prints if desired. Describes AIR-way Multifold Window Hardware.
Architectural Details. Booklet, 8½ x 11 ins., 16 pp. Tables of specifications and typical details of different types of construction.
List of Parts for Assembly. Booklet, 8½ x 11 ins., 16 pp. Full lists of parts for different units.

WINDOW SCREENS

Detroit Steel Products Co., 2250 E. Grand Boulevard, Detroit.
Fenestra Screen Casements. Brochure, 16 pp., 8½ x 11 ins. Illustrated.

Orange Screen Company, Maplewood, N. J.
New Vogue Aluminum Frame Screens. Booklet, 12 pp., 3½ x 8½ ins. Illustrated.

WINDOW SHADES AND ROLLERS

Columbia Mills, Inc., 225 Fifth Avenue, New York, N. Y.
Window Shade Data Book. Folder, 28 pp., 8½ x 11 ins. Illustrated.
Window Shade Rollers. Brochure, 24 pp., 8 x 11 ins. Illustrated. Rollers and accessories.

WINDOWS, STEEL AND BRONZE

David Lupton's Sons Company, Philadelphia, Pa.
A Rain-shed and Ventilator of Glass and Steel. Pamphlet, 4 pp., 8⅝ x 11 ins. Deals with Pond Continuous Sash. Sawtooth Roofs, etc.
How Windows Can Make Better Homes. Booklet, 3⅞ x 7 ins., 12 pp. An attractive and helpful illustrated publication on use of steel casements for domestic buildings.

Truscon Steel Company, Youngstown, Ohio.
Drafting Room Standards. Book, 8½ x 11 ins., 120 pages of mechanical drawings showing drafting room standards, specifications and construction details of Truscon Steel Windows, Steel Lintels, Steel Doors and Mechanical Operators.
Truscon Solid Steel Double-Hung Windows. 24 pp. Booklet, 8½ x 11 ins. Containing illustrations of buildings using this type of window. Designs and drawings of mechanical details.
Continuous Steel Windows and Mechanical Operators. Catalog 126. Booklet, 32 pp., 8½ x 11 ins. Illustrated.

WOOD—See also Millwork

American Walnut Mfrs. Association, 618 So. Michigan Boulevard, Chicago, Ill.
American Walnut. Booklet, 7 x 9 ins., 46 pp. Illustrated. A very useful and interesting little book on the use of walnut in Fine Furniture with illustrations of pieces by the most notable furniture makers from the time of the Renaissance down to the present.
American Walnut for Interior Woodwork and Paneling. 7 x 9 ins. Illustrated. Discusses interior woodwork, giving costs, specifications of a specimen room, the different figures in Walnut wood, Walnut floors, finishes, comparative tests of physical properties and the advantages of American Walnut for woodwork.

Curtis Companies Service Bureau, Clinton, Iowa.
Curtis Cabinet and Stair Work. Booklet, 47 pp., 7¾ x 10½ ins. Illustrated.
Curtis Windows. Brochure, 7¾ x 10½ ins. Illustrated.
Curtis Interior Doors. Booklet, 7¾ x 10½ ins. Illustrated.
Curtis Entrances and Exterior Doors. Brochure, 7¾ x 10½ ins. Illustrated.

National Lumber Mfrs. Assn., Washington, D. C.
Airplane Hangar Construction. Booklet, 24 pp., 8½ x 11 ins. Use of lumber for hangars.
Modern Home Interiors. Booklet, 8½ x 11 ins. Illustrated. Deals with interior uses of wood.

WOOD FINISH

Minwax Company, Inc., 11 West 42nd St., New York.
Color card and specification for Minwax Flat Finish. Folder, 4 pp., 8½ x 11 ins. Illustrated. Deals with a penetrative, preservative stain finish giving stain and soft wax effect.

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Miscellaneous Telephone and Signal Accessories.

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In answer to the modern vogue for color the popular Monophone may now be had, not only in black, but also in a variety of beautiful colors. Made of solid colored bakelite, with chromium or gold plated fittings.

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Architects tell us that clients are usually bubbling over with ideas. They know just what the architectural type should be. The exposure. The number of rooms, and where and why. But lumber? . . . "Well, you take care of that." And that's just what you do, along with a thousand other details.

Trade-marked Pondosa Pine simplifies the lumber question for you as well as for the builder. It means that the pine has been rigidly graded and milled, that it is carefully seasoned, and that the finish will always be beautiful and satiny smooth. It means that for any softwood purpose, Pondosa Pine is the ideal lumber.

Let Pondosa Pine take care of your lumber problems. Specify pine by the mark of the pine tree. Pondosa does the rest. Address Dept. 75, Western Pine Manufacturers Association, Portland, Oregon.

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Your inquiry is solicited by our engineering department; full cooperation is promised. *The Vilter Manufacturing Company, 816 Clinton Street, Milwaukee, Wisconsin.*

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For an authoritative solution of your refrigeration problems consult our Engineering Department.

59-29

SINCE 1867

NOW...
Moisture Content

Is Specified in
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Grading Rules

STEP by step Southern Pine Association mills have led in the development of perfected manufacturing methods, to meet the needs of the lumber trade.

Uniform grades, supervision of grading at the mill, grade marking, and NOW... For each grade a guaranteed maximum moisture content.

These moisture content limitations now apply to all standard grades of Southern Pine lumber. Excessive moisture is now a defect, just as checks and knots.

Require the official grade mark. It is your guarantee of good lumber, correctly manufactured, properly dried and accurately graded . . . lumber that has been brought from the "Wilderness of Doubt" by the progressive activity of Southern Pine Association mills.

Have you received your copy of the Moisture Content booklet? One is waiting for you. Send for it today.

Southern Pine Association
NEW ORLEANS

Nathan Straus & Sons, Inc.

are pleased to announce that during the year 1929 the Walter J. Buzzini Kitchen Equipment Factory, which adjoins their showrooms at 66 West 23rd Street, has designed and built the following conspicuous installations:

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Dayton-Biltmore Hotel, Dayton, Ohio
Tudor City, "Woodstock Towers," N. Y. City
Hotel Charles, Springfield, Massachusetts
Hotel in connection with The Doctors' Hospital, 87th St. and East End Ave.

RESTAURANTS:

Bank of America, Lunch Club, 44 Wall St.
Clark Dodge & Co., Lunch Club, 61 Wall St.
Lunchroom in Commodore Hotel, New York
Paramount Inn, Brooklyn, New York
Wil-low Cafeterias, New York City.

INSTITUTIONS:

The Doctors' Hospital, 87th St. and East End Ave.
The Babies' Hospital, Newark, New Jersey
Holy Trinity Church, Seaman Ave., New York City
Jewish Community Center, Yonkers, New York
Am. Baptist Home Mission Society, 10th St. and 2nd Ave.

AVIATION FIELD:

Curtiss Flying Service, Detroit, Michigan

In anticipation of an even larger business during 1930, plans are now being drawn for an increase in factory space. The enlarged factory is being laid out under the personal direction of:

MR. WALTER J. BUZZINI
Vice-President In Charge Of Kitchen Equipment Division
of

Nathan Straus & Sons, Inc.

66 West 23rd St., At Sixth Ave.
New York City

KITCHEN PLANNING DESIGNING and ENGINEERING

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Our service covers every phase of the kitchen, from its layout, to its complete equipment, for preparing and serving food. Savings in time and labor of operation assured. Standardized and special equipment furnished. We recruit from the world's markets. No playing favorites. The need defines the selection.

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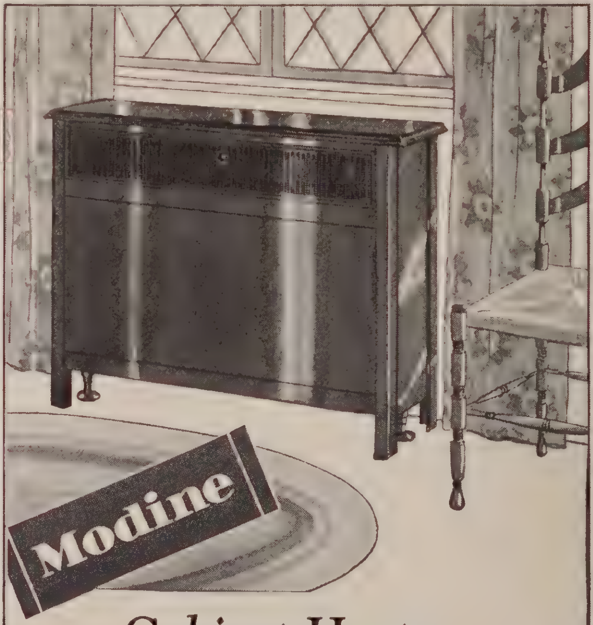
40-53 E. 21st Street
NEW YORK CITY



Cabinet Heaters

— the modern copper radiation equipment that offers the combined advantages of better heating and better room appearance. Write for catalog.

MODINE MANUFACTURING CO.
1718 Racine St. *(Heating Division)* Racine, Wis.
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The Marshall Field Garden Homes as they appear in a bird's-eye view. Andrew J. Thomas, Architect, New York City; Graham, Anderson, Probst & White, Associate Architects, Chicago.

THE 628 KITCHENS IN THE
Marshall Field Garden Apartment Homes
are equipped with
FRIGIDAIRE

A letter from Mr. Rosenthal

"We are enclosing signed copies of a contract for six hundred twenty-eight (628) Frigidaires for the Marshall Field Garden Apartment Homes.

"As you know, this is a non-profit project, providing apartments to rent at cost. Because of this, we are particularly concerned not only as to the quality and character of the equipment, but the operating and maintenance cost, that the occupants of these apartments may have the very best possible service at the lowest possible cost."

Yours very truly,
O. W. Rosenthal—Cornell Co.,
O. W. Rosenthal, President

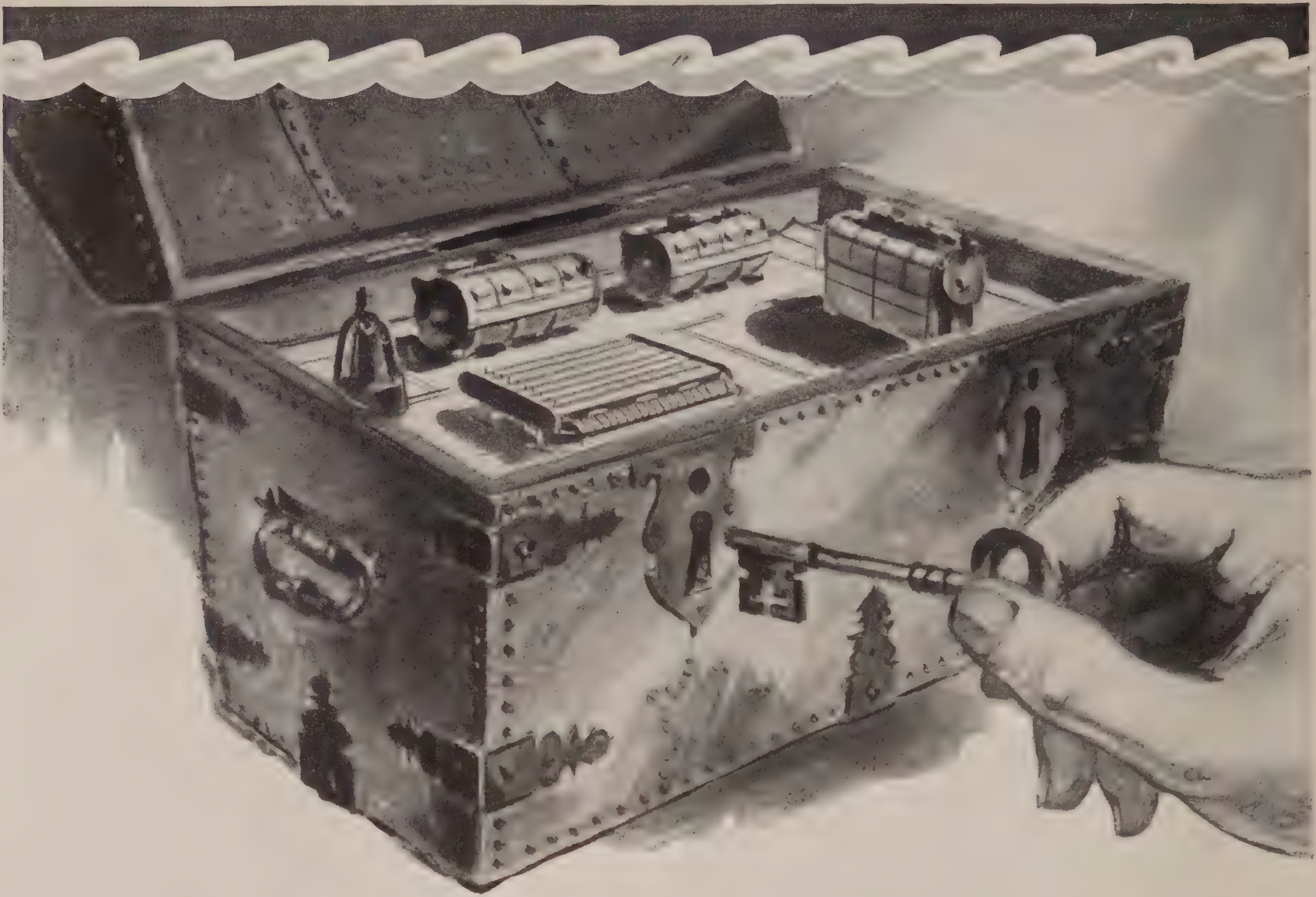
Wherever used, Frigidaire saves so much money and food, and costs so little to operate, that more have been sold than all other electric refrigerators combined.

And today Frigidaire offers as an added feature the famous "Cold Control"—a patented device for providing extra cold temperatures for speeding the freezing of ice cubes, and making new varieties of frozen delicacies.

Let us send you complete information about Frigidaire—the low prices—General Motors liberal terms. Write today. Frigidaire Corporation, Subsidiary of General Motors Corporation, Dayton, Ohio.

Frigidaire Corporation, Department A-211, Dayton, Ohio. Please send me, free, complete literature especially prepared for the architect and builder.

Name.. Address..



Troy Advisory Service

offers you the *key* to laundry planning problems

From an experience covering fifty years, Troy has assembled a veritable treasury of information on the proper correlation of the many factors to be considered in planning institutional laundries. Through TROY ARCHITECTS' ADVISORY SERVICE, this information is offered to architects without cost or obligation.

How to determine plant location... how to select and where to place machinery...where to put bin and storage space...how to provide for future expansion...let Troy engineers cooperate at every step in supplying the correct answers. Feel free to consult Troy.

TROY LAUNDRY MACHINERY COMPANY, INC.
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TROY
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SINCE 1879 . . . THE WORLD'S PIONEER MANUFACTURER OF LAUNDRY MACHINERY

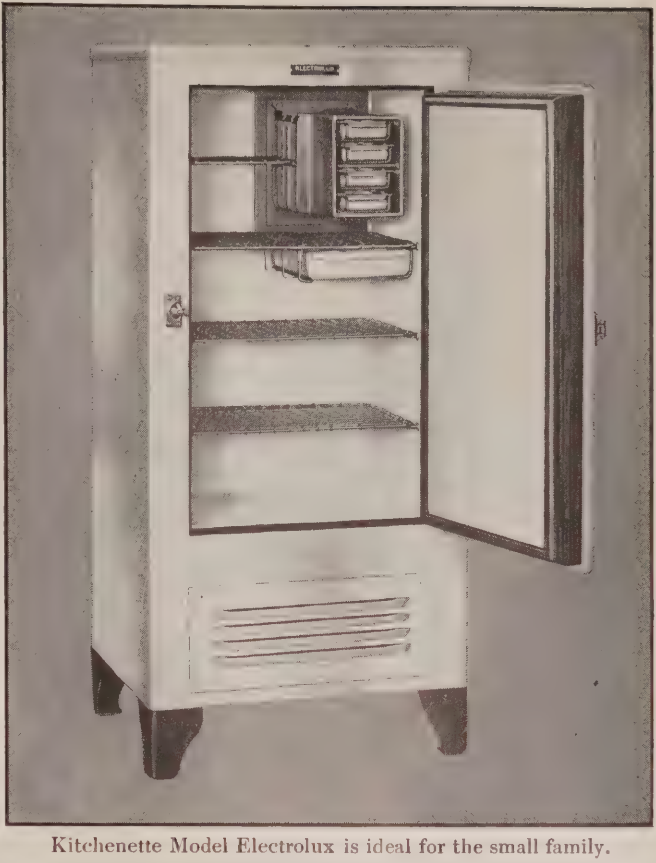
SPECIFY ELECTROLUX *because it is* NOISELESS

Unique advantages . . . conspicuous success of Electrolux Gas Refrigeration has won confidence

ARCHITECTS everywhere are specifying this most modern of all refrigerating systems for up-to-date apartments. From California we hear that noiseless Gas Refrigeration means faster rentals. From Chicago come reports of fewer tenant complaints in Electrolux-equipped buildings. The South writes of the economy and lack of need for service of Gas Refrigeration. And from metropolitan New York, the hardest market in the world, we get amazing figures. 20,859 Electrolux refrigerators installed in apartments alone in but nine short months! It's hardly surprising that the newest and finest of apartments insist on Electrolux Gas Refrigeration. The public has accepted it with enthusiasm.

Unique advantages

Electrolux has no machinery . . . no moving parts. This means that there is never the slightest whisper of sound to irritate and dissatisfy tenants. And it means there are no belts, fans or compressors to wear out and run up annoying service bills. A tiny gas flame is the whole "works" of the Gas Refrigerator. Furthermore, Electrolux is the cheapest to operate of all refrigerating systems.



Kitchenette Model Electrolux is ideal for the small family. Food capacity—4 cu. ft., 36 large ice cubes between meals.

Write today for full information about Electrolux Gas Refrigeration . . . the many different models for apartments and houses . . . the lovely color harmonies. Servel Sales, Inc., Evansville, Indiana.

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THE *Gas* REFRIGERATOR

FASHIONABLE APARTMENTS EVERYWHERE are being equipped with the newest and finest refrigerator... Electrolux. The one shown here is the Hudson Gables in New York City.

A tiny gas flame takes the place of all moving parts.

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INCINERATION JOB

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THERE'S A SPECIAL TYPE

INCINOR

INCINORS will dispose of anything wet or dry—rubbish, garbage, factory refuse, sludge, industrial wastes of all kinds and medical matter. They burn it with gas—The Decent Way—odorlessly, quickly and economically, without soot or embers. They come in three types: Portable Incinors for dwellings in two to nine bushels capacities; Brick Set Incinors for general industrial usage in capacities of 175 pounds per hour up; Forced Draft Incinors for municipalities and other large jobs specially designed for each installation in capacities up to 100 tons daily. All are the last word in modern incineration science, incorporating many exclusive features that insure super-satisfaction. Make a mental note—*Incinor for the best incineration!*

Complete architectural data on all models will be gladly sent for the asking.

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MODERN WASTE FURNACES
Good Riddance
GARBAGE · RUBBISH · TRASH

BURN IT WITH GAS
THE DECENT WAY

HOME INCINERATOR COMPANY, *Security Building*, Milwaukee, Wisconsin

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FOR YOUR CONVENIENCE

HOME INCINERATOR COMPANY
Dept. I-12, Security Bldg., Milwaukee, Wis.

Kindly send complete architectural files on all types Incinor.

Name .... *Address* .... *City* ....

9 out of 10 Modern Hotels have Monel Metal equipped kitchens

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HOTEL STE CINCINNAT
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BEN FRANKLIN, PHILADELPHIA—ROYAL HAWAIIAN HOTEL
—LORD BALTIMORE, BALTIMORE—ROYAL YORK, TORONT
OTEL ROOSEVELT, NEW ORLEANS—OLYMPIC HOTEL, SEATTLE
NICCOLET HOTEL, MINNEAPOL GOVERNOR CLINTON,
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This preference should carry weight with Architects.....

IF you have made a study of modern hotels—those built in the last decade—you have found that most of them have Monel Metal food service equipment.

Hotel owners and operators expect to have architects specify Monel Metal...because this silvery alloy has become the standard material of construction for high quality food service equipment.

Those who have used it—in hotels, restaurants, or home kitchens—have learned from actual experience that Monel Metal stays bright and clean through years of hard service. Users like its beautiful, silvery appearance—its remarkable cleanability—its durability and economy.

Monel Metal will not rust. It resists corrosion. It has no coating to chip, crack or wear off. Monel Metal's lustrous surface can be kept spotlessly clean with very little care. Consequently, this Nickel alloy is recognized as the ideal material for kitchen equipment—in hotels, restaurants, hospitals, institutions ...and homes.

Since Monel Metal's national advertising always directs the reader to the architect, it is important that you have in your file complete information on Monel Metal.

MONEL METAL
MODERN AS TOMORROW

INCO MONEL METAL TRADE MARK

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York, N.Y.

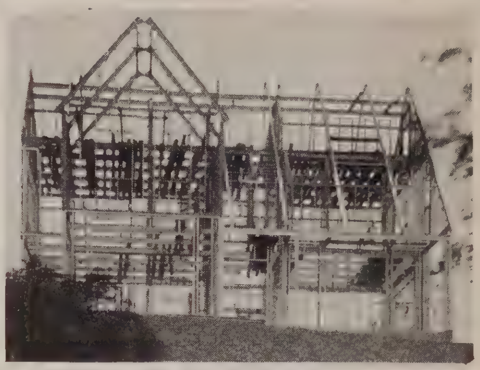
Monel Metal is a technically controlled Nickel-Copper alloy of high Nickel content. It is mined, smelted, refined, rolled and marketed solely by The International Nickel Company, Inc. The name "Monel Metal" is a registered trade mark.

The International Nickel Company, Inc.
67 Wall Street, New York, N.Y.

Please send me literature describing the use of Monel Metal for
☐ Food Service Equipment
☐ Home Kitchen Equipment

Name --
Address --
Company --

What Else Do you want to know *about* This Construction?



I

QUESTION: What is Steel Framing?

ANSWER: A light structural steel framework for constructing homes.

II

QUESTION: What kind of homes?

ANSWER: Every kind—brick, stone, stucco—large or small.

III

QUESTION: Must they be standardized designs?

ANSWER: No! Steel Framing is adaptable to any design or any style of architecture.

IV

QUESTION: How is it made up?

ANSWER: Steel Framing Plans are taken direct from your drawings. Every piece is fabricated at the mill and delivered to the building site ready for immediate erection.

V

QUESTION: (a) How much extra work is there for architects? (b) Builders?

ANSWER: (a) None. (b) None.

VI

QUESTION: Does it require special workmen for erection?

ANSWER: No! Men familiar with home building and with the use of ordinary tools can erect Steel Framing quicker and easier than any other framing.

VII

QUESTION: What materials can be used in completing the structure?

ANSWER: All standardized materials that are used with any other framing.

VIII

QUESTION: What are a few of the definite advantages of Steel Framing.

ANSWER: (1) It is the strongest, most rigid construction in home building. (2) It wards off depreciation and maintains property value. (3) It is firesafe. (4) It is the kind of construction that provides a better and a more comfortable home. (5) It can not shrink or warp.

IX

QUESTION: Will you send specific information on any other question that pertains to Steel Framing?

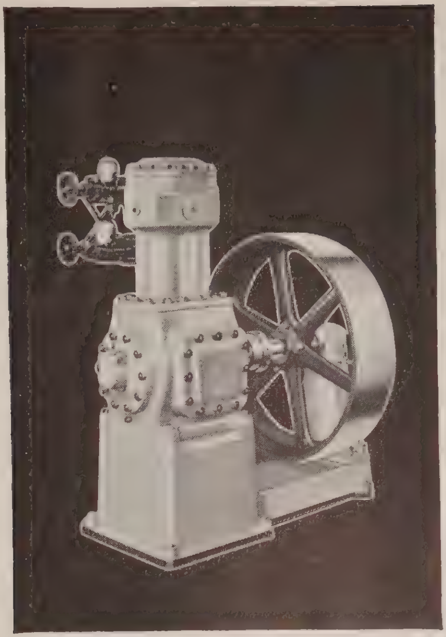
ANSWER: Yes, gladly. Write to Steel Frame House Company, Oliver Building, Pittsburgh, Pa.

STEEL FRAME HOUSE COMPANY, Oliver Building., Pittsburgh, Pa.

Subsidiary of McClintic-Marshall Corporation

STEELFRAMING

THE MODERN METHOD OF HOUSE CONSTRUCTION



LOWER OPERATING COST

is one important factor » » but it is ONLY ONE!

Since service expense and depreciation must also be considered in determining the true value of any electric refrigerating machine, operating cost is naturally only one important factor. Cost of ownership includes all of these value considerations.

Lipman electric refrigerating machines are so carefully engineered and are made of such fine materials that service expense is almost nil. Depreciation is unusually modest « » part replacements are rare even after years of continuous service.

To Lipman's lowest cost of ownership, add exceptional quietness and full automatic operation « » then you'll understand why you should know the facts about the Lipman before you buy electric refrigeration.

Let us rush the complete information to you by return mail. Send today! No obligation.

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ELECTRIC REFRIGERATION

GENERAL REFRIGERATION COMPANY, BELOIT, WISCONSIN. DEPT. M-27

NAME ____________________ FIRM NAME ____________________

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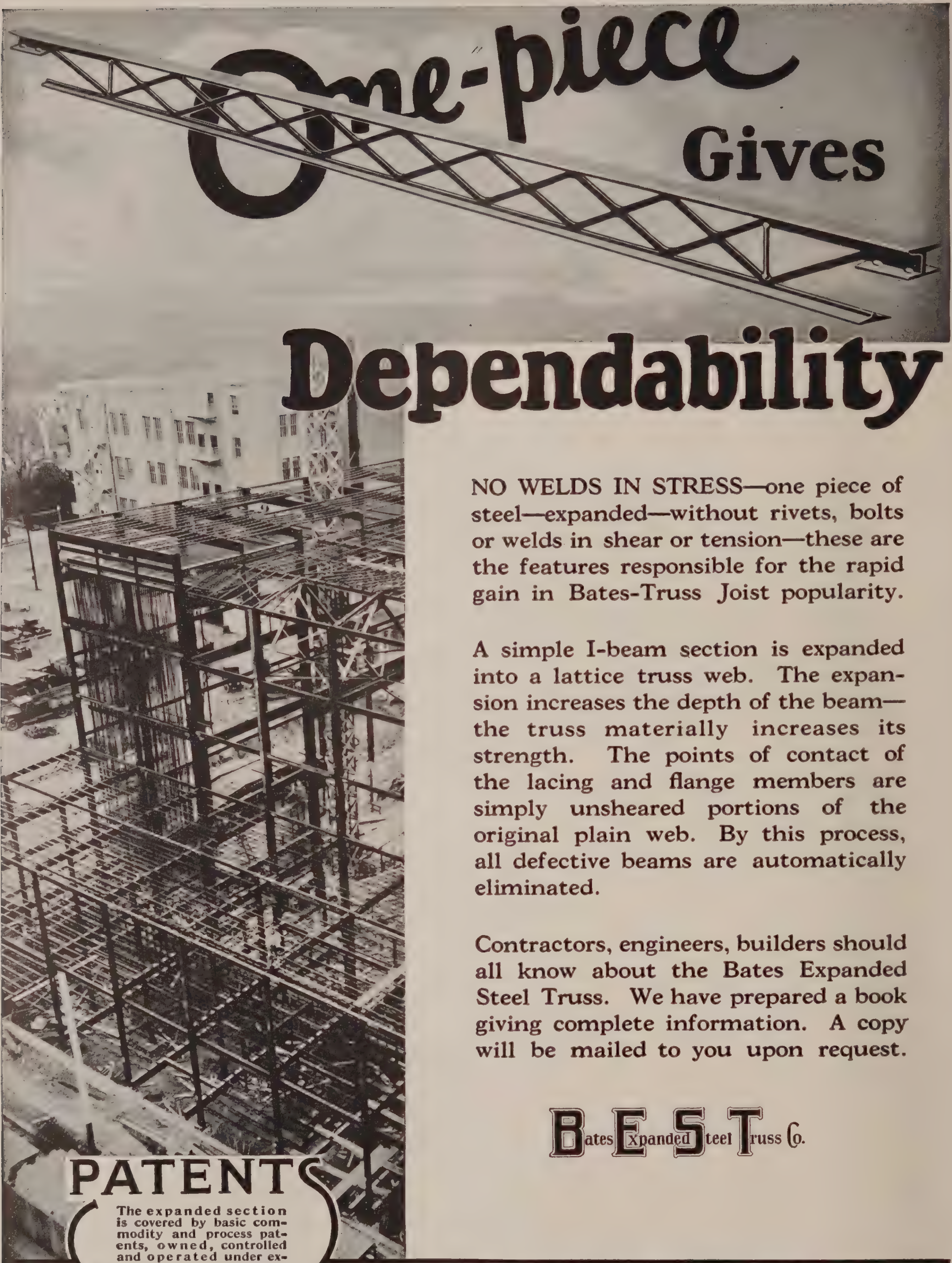
One-piece Gives Dependability



NO WELDS IN STRESS—one piece of steel—expanded—without rivets, bolts or welds in shear or tension—these are the features responsible for the rapid gain in Bates-Truss Joist popularity.

A simple I-beam section is expanded into a lattice truss web. The expansion increases the depth of the beam—the truss materially increases its strength. The points of contact of the lacing and flange members are simply unsheared portions of the original plain web. By this process, all defective beams are automatically eliminated.

Contractors, engineers, builders should all know about the Bates Expanded Steel Truss. We have prepared a book giving complete information. A copy will be mailed to you upon request.

Bates Expanded Steel Truss Co.

PATENT

The expanded section is covered by basic commodity and process patents, owned, controlled and operated under exclusively by this company.

PANTAGES THEATRE, Fresno, Cal.
B. Marcus Priteca, Archt.
Earl B. Newcomb, Eng.

BATES-TRUSS JOISTS

Sales, Engineering and Executive Offices EAST CHICAGO, IND.

for additions *and* remodeling

HAVEMEYER Trusses can be handled and placed so speedily, easily and with so little temporary structure required, that they are ideal for additions, remodeling and rebuilding. They make possible all the advantages of fireproof construction, yet do not overburden even a small job with heavy preparatory and equipment expenses.

Being available in graduated lengths up to a 31-foot span, no cutting or fabricating is required. Each truss is placed, braced and secured with ordinary labor. Concrete Steel Co., 42 Broadway, New York.

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Executive Offices: 42 Broadway, New York
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Concrete Steel Co.

TONCAN~a Plaster Reinforcement PLUS! (A metal Lath that resists rust)

Corridor in New York Life Insurance Suite,
New York Life Building, New York City.
CASS GILBERT, *Architect*

WHEN a plaster job assumes the responsibility of period interpretation in ceiling, sidewall, pilaster and arch, the lath specification takes on a new significance.

A plaster reinforcement, expanded from Toncan Copper Molybdenum Iron with its universal acceptance for rust resistance, would, in itself, justify preference. In addition, all Berloy laths have resquared ends, full covering width and the maximum number of strands per square inch to insure plaster economy and strength.

When you specify Toncan, your plaster base exemplifies the modern application of product justification.

A Berloy lath for every purpose.

REG. U. S. PAT. OFF.

TONCAN

COPPER

Mo-lyb-den-um

IRON

METAL LATH

COMPLETE INFORMATION UPON REQUEST

THE BERGER MANUFACTURING CO.

CANTON, OHIO

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Chicago	Detroit	Los Angeles	Philadelphia	San Francisco
Cleveland	Jacksonville	Minneapolis	Pittsburgh	St. Louis

Export Dept.—Canton, Ohio

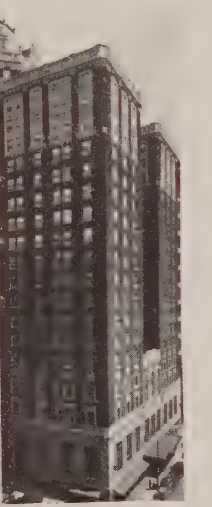
These modern hotels
--and many more

The Sherry-Netherland—*New York*

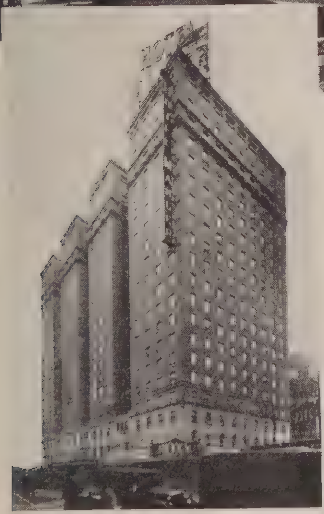
The Los Angeles-Biltmore

Barlum Hotel and Tower—*Detroit*

Left:
The Mark Hopkins
San Francisco


Above:
The Lord Baltimore
Baltimore

Above:
The Morrison
Chicago


Left:
The Manger
New York

Hotels in every important city of the United States and many foreign countries have Bethlehem Wide-Flange Structural Shapes—generally known as Bethlehem Sections—in their steel framework.

Bethlehem Sections are likewise being extensively used in the framework of industrial buildings, bridges, hangars, apartments, theatres, office and bank buildings, public buildings, and numerous other structures. Architects, engineers and contractors the world over have long recognized the light weight and the economy in cost of fabrication of these Wide-Flange Shapes.

With the introduction, about one year ago, of 33- and 36-inch Sections, Bethlehem further broadened the service of a famous series of shapes. Bethlehem Wide-Flange Structural Shapes—H-Columns, I-Beams and Girder Beams—are being rolled in all popular sizes on regular schedule at the Bethlehem, Pa., and Lackawanna, N. Y., Plants.

BETHLEHEM STEEL COMPANY

General Offices: Bethlehem, Pa.

District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Detroit, Cincinnati, Chicago, St. Louis, San Francisco, Los Angeles, Seattle, Portland, and Honolulu.

Bethlehem Steel Export Corporation, New York City
Sole Exporter of our Commercial Products

BETHLEHEM

WIDE-FLANGE STRUCTURAL SHAPES

THE IRVING TRUST COMPANY BUILDING

At One Wall Street, New York City, is rising this magnificent 50-story structure. Carnegie Beams were chosen for its structural steel framework. Naturally we are proud to add this beautiful building to the imposing list of structures in which these beams have been incorporated since their introduction in 1927.

Literature on request

Voorhees, Gmelin & Walker, Architects
H. G. Balcom, Structural Engineer
Marc Eidlitz & Son, General Contractors
American Bridge Company, Fabricators
Post & McCord, Structural Steel Contractors

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Irving Trust Company, New York

43

CARNEGIE STEEL COMPANY
Subsidiary of United States Steel Corporation
PITTSBURGH PENNA.

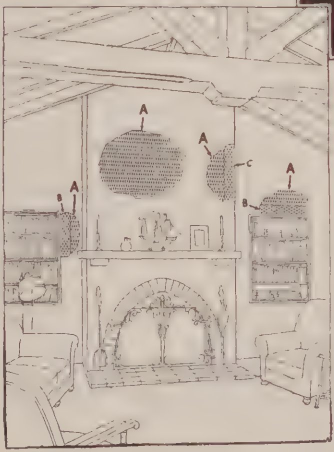
MILCOR Stay-Rib Metal Lath Provides the Reinforcement That Protects Plastered Walls and Ceilings

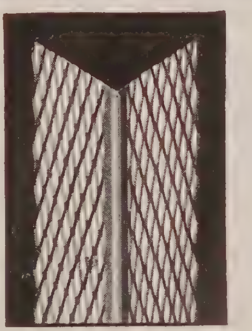
IT is an accepted fact that the plaster base plays the most important part in the protection of beautiful walls and ceilings . . . and it follows logically that the more perfect the plaster base, the greater is the assurance of permanence.

Milcor Stay-Rib Metal Lath is a definite advance in the design of expanded metal plaster bases. It has unusually strong reinforcing longitudinal ribs. It has a mesh design that firmly imbeds the plaster with slight pressure. It provides an adequate key without waste . . . and lastly; it is given additional strength through a special *Milcor* reannealing process.

These combined features have made *Milcor* Stay-Rib metal lath the accepted assurance of permanently reinforced walls and ceilings. Architects specify it with utmost confidence. It is one of the famous *Milcor* Fireproof Products which also include *Milcor* Expansion Casing and Corner Bead. Complete information is contained in the *Milcor* Manual.

MILWAUKEE CORRUGATING CO.
1405 Burnham St. Milwaukee



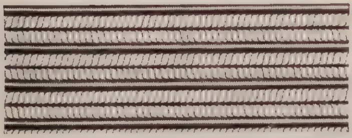


(C)
Milcor Expansion Corner Bead is distinguished by its expanded metal wings . . . This feature . . . a *Milcor* patent . . . permits a perfect grip upon the plaster and prevents chipping off from unavoidable abuse.

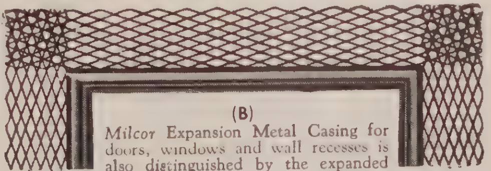
MILCOR Expanded Metal Building Products are Available in

ARMCO Ingot Iron

Copper Alloy Steel



(A)
Milcor Stay-Rib Metal Lath has unusual strength and rigidity. Its design . . . a *Milcor* patent . . . affords the maximum protection against plaster cracks.

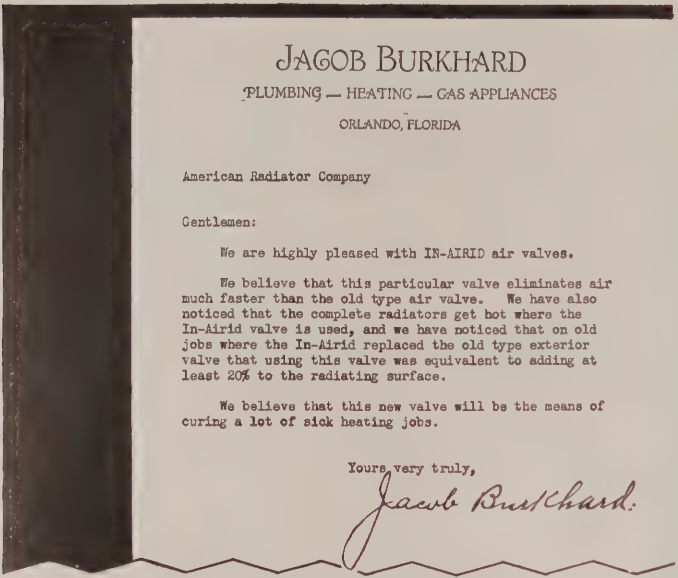


(B)
Milcor Expansion Metal Casing for doors, windows and wall recesses is also distinguished by the expanded metal wings. It cannot pull away during settlement and will not leave cleavage cracks.

MILCOR PRODUCTS

Branches: Chicago, Ill., Kansas City, Mo., La Crosse, Wis.
Sales Offices: Boston, Mass., Detroit, Mich., Atlanta, Ga., Little Rock, Ark., Minneapolis, Minn., Los Angeles, Calif.
Eastern Plant: THE ELLER MANUFACTURING CO., *Canton, Ohio*

"We are very much pleased with IN-AIRIDS"



JACOB BURKHARD
PLUMBING — HEATING — GAS APPLIANCES
ORLANDO, FLORIDA

American Radiator Company

Gentlemen:

We are highly pleased with IN-AIRID air valves.

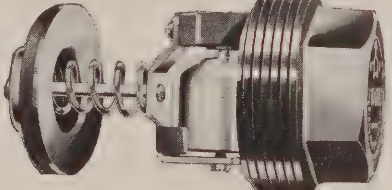
We believe that this particular valve eliminates air much faster than the old type air valve. We have also noticed that the complete radiators get hot where the In-Airid valve is used, and we have noticed that on old jobs where the In-Airid replaced the old type exterior valve that using this valve was equivalent to adding at least 20% to the radiating surface.

We believe that this new valve will be the means of curing a lot of sick heating jobs.

Yours very truly,
Jacob Burkhard.

"like adding 20% to the radiating surface"

THE heating contractor who made this statement is no exception, for everywhere that In-Airid Valves have been tried, we find the same kind of enthusiasm. In-Airids insure complete venting, do away with the air valves on the outside of the radiator and prevent tampering.



The In-Airid way is the modern way to vent new type steam radiators. They add good looks and distinction to your installations. In-Airid features can not be found in any other air valve.

IN-AIRID

The Invisible AIR VALVE

No. 1 for Steam . . . . . No. 2 for Vacuum

Airids No. 500 and Vac-Airids No. 510 are still the best valves to use for replacement on old-style steam radiation.

AMERICAN RADIATOR COMPANY
Makers of a complete line of HEATING ACCESSORIES

AUTOMATIC HOME HEATING

on a new scale

THOUSANDS of HOME OWNERS voice their praises of this MODERN AUTOMATIC SYSTEM. It sounds not one—but many new notes in home heating comfort. It harmonizes ALL the requirements for heating perfection—whatever the scale of living. For mansion or cottage, and for any heating plant—warm air, steam, vapor or hot water. Also ideal for hot water supply.

The ELECTRIC FURNACE-MAN burns ANTHRACITE in the economical Buckwheat sizes. It feeds coal, removes ashes and maintains a uniform temperature, whatever the location, however severe the weather. No smudge, smoke or odor. No grates to shake, no drafts to regulate.

Compact, sturdy and marvelously efficient. Easy to install, moderate in price. Distributors and Dealers in over 300 cities. Write for interesting booklet.

Endorsed by ANTHRACITE OPERATORS' CONFERENCE

The Electric Furnace-Man

PATENTED AUTOMATIC COAL BURNER
Product of
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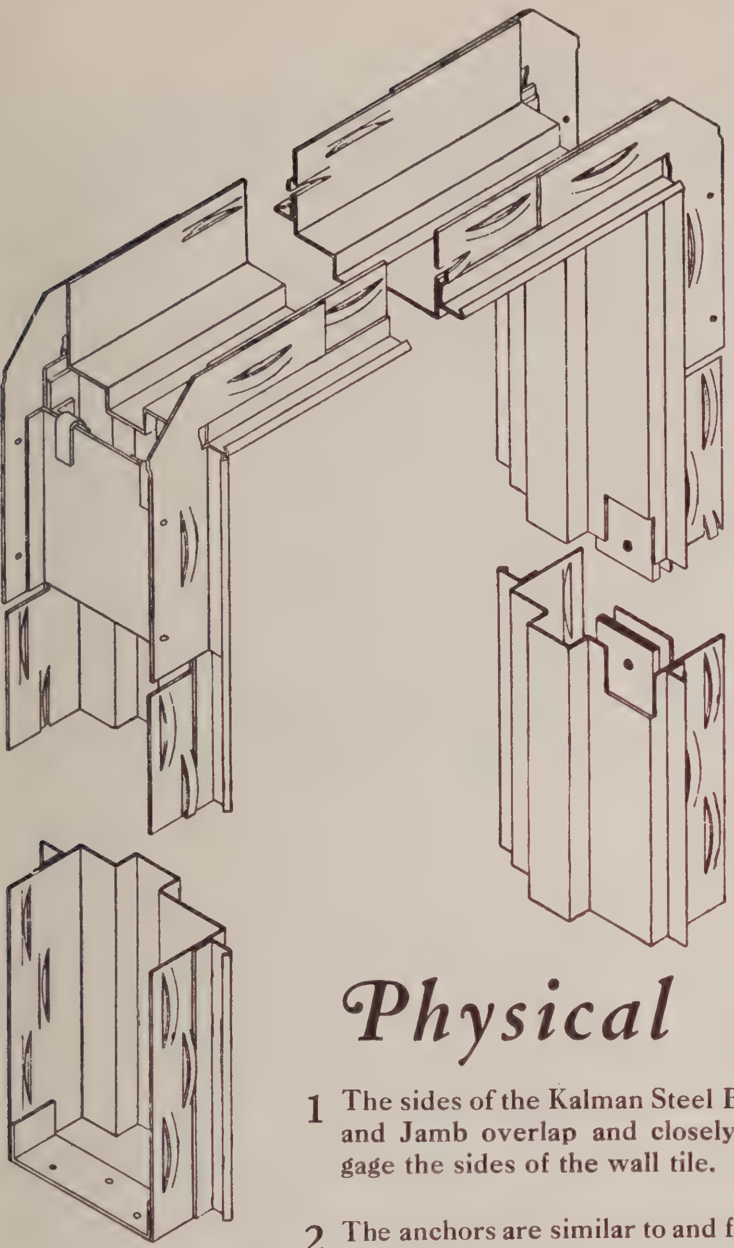

The IMPROVED STEEL BUCK *and* JAMB

In the Kalman Steel Jamb, form truly follows function.

Kalman Steel Jamb is not made in imitation of wood, but is designed to give steel character as steel and is in keeping with our interpretation of the modern trend of architectural design.

Physical Characteristics

1. The sides of the Kalman Steel Buck and Jamb overlap and closely engage the sides of the wall tile.
2. The anchors are similar to and function like Terra Cotta anchors and are visible where they attach to the Jamb until the wall is plastered, thus their use or omission can be easily verified.
3. The Jamb is supplied with elements which form definite grounds and metallic terminations for the plaster.
4. The sides are expanded into rows of loops which form a mechanical bond and reinforcement for the plaster over a wide area.
5. The plaster passes through the perforations, back of the loops to the sides of the tile.
6. The body of the Jamb is made of specially treated steel and the face is finished with Duco primer. The terminals are made of specially treated galvanized sheets and form a bond at the junction, with the plaster similar to that provided by Corner Bead.

KALMAN STEEL COMPANY

KALMAN STEEL

MODERN, FIRE-SAFE BUILDING PRODUCTS

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Baltimore
Boston
Buffalo

Charlotte
Chicago
Cleveland
Columbus

Dallas
Dayton
Detroit
Houston

Milwaukee
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Newark
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Niles
Philadelphia
Pittsburgh
St. Louis

St. Paul
Syracuse
Washington, D. C.
Youngstown

A Complete File of Information

A Manual of Information for Architects on Automatic Oil Burners
May Oil Burner Corporation
Baltimore, Maryland
Automatic Oil Burners
QUIET MAY
A.I.A. File No. 30g1

Here, bound between the two covers of a book, is an entire filing cabinet of information on oil heating.

This book was published to answer the architect's need for a Manual of Information on Automatic Oil Burners. It thoroughly covers every angle of oil heat.

Basement Floor Plans, Fundamentals of Oil Heat, Boilers, Automatic Control of Oil Burners, Sample Specifications and Regulation of the National Board of Fire Underwriters are but a few of the many subjects covered.

Members of the Profession from almost every country in the world have requested a copy of this Manual for their files.

If you are without one, we will gladly see that you receive a copy of this Manual if you will send us your name and address.

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Please send your manual of information for architects to

Individual..
c/o Firm..
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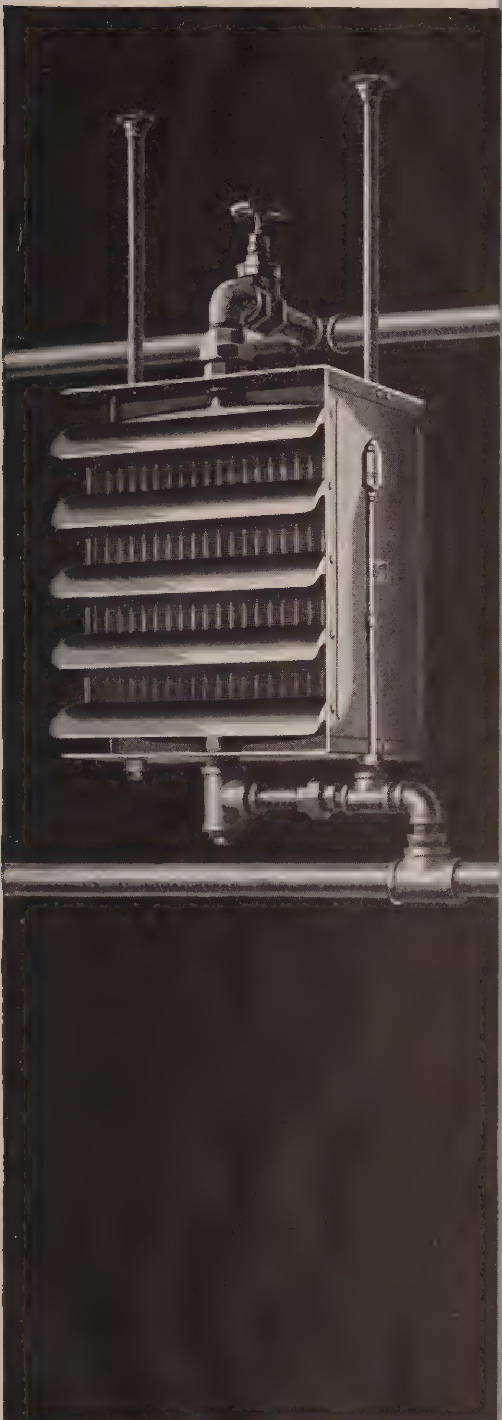
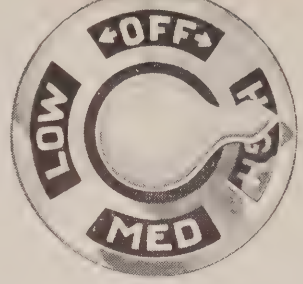
City..State........................

HEAT WITH UNIT HEATERS





"Heat Control" ..an invaluable feature of Venturafin Unit Heaters

A vital factor in heating stores, offices, garages, factories and many other buildings

1—No building is too large or too small to receive the benefits and economies of the Venturafin Method of Heating.

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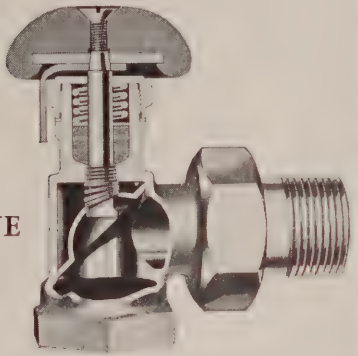

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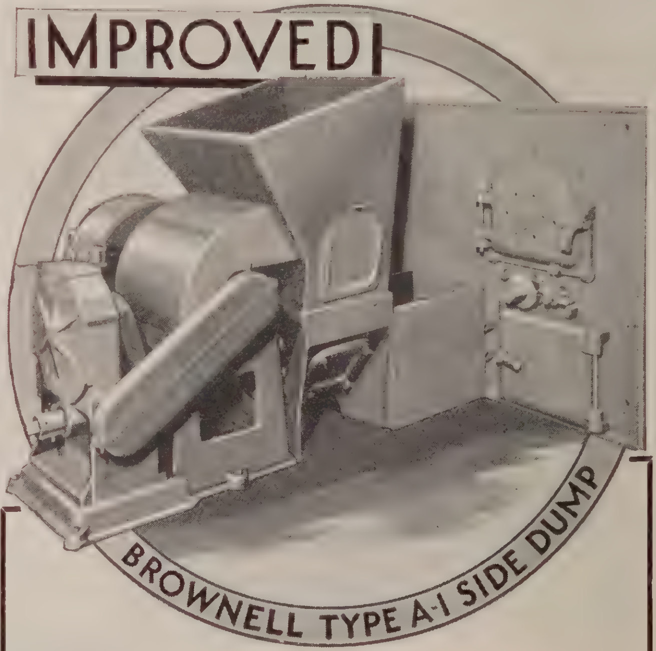

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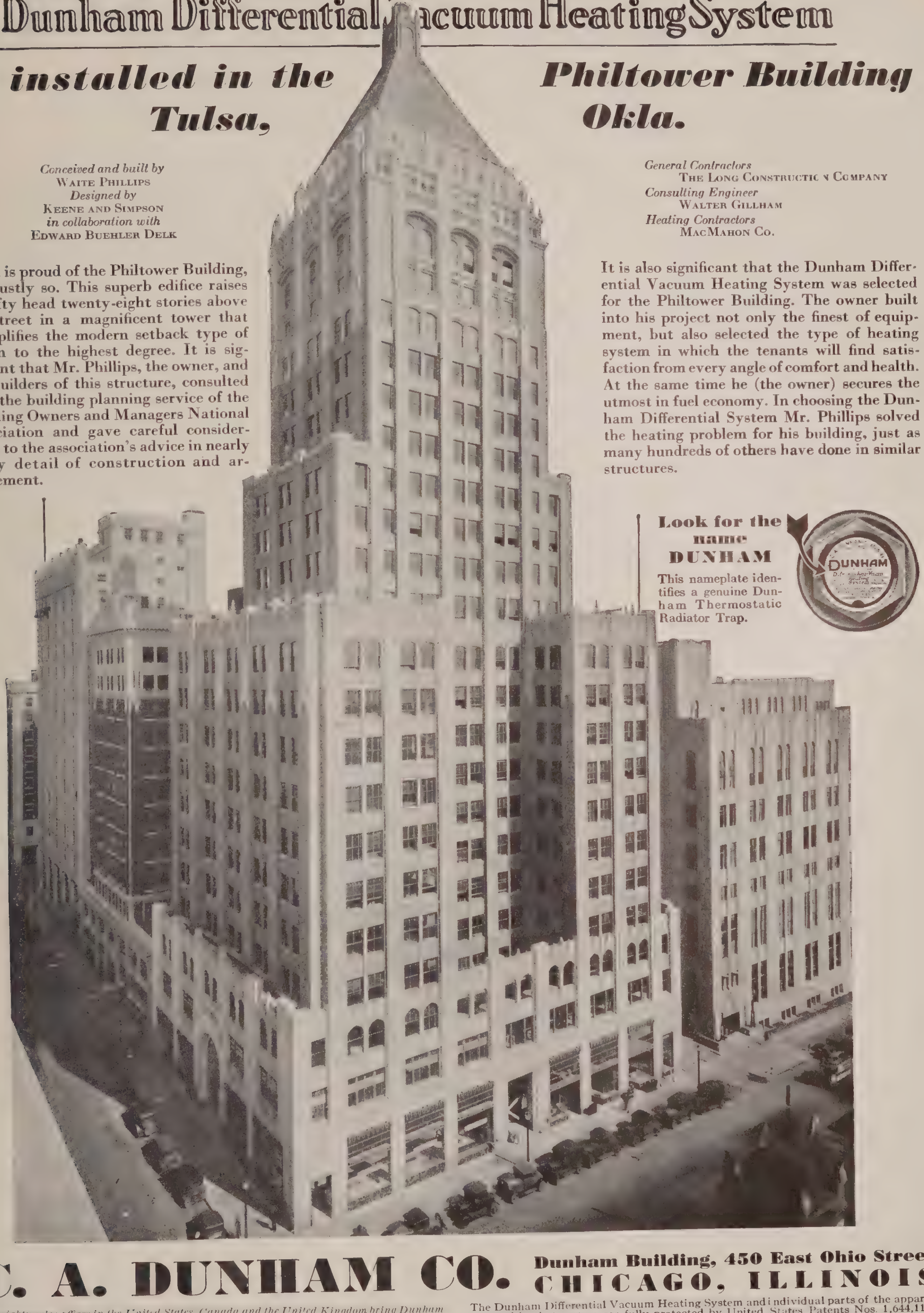

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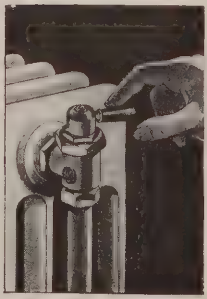

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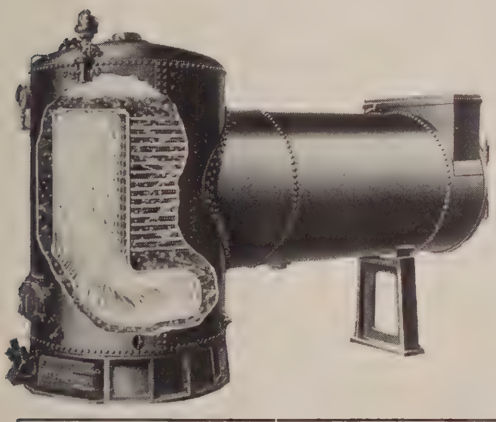

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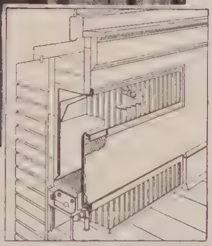

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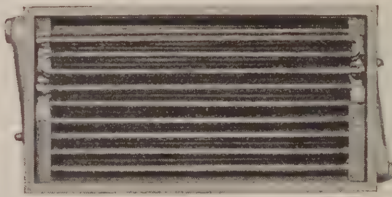

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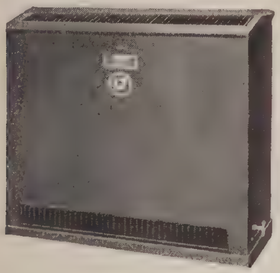

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The Roosevelt School, pictured above, is one of four completed this year in Lackawanna, N. Y., all the outcome of three prior installations in 1923 and 1924.

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REVIEWS OF MANUFACTURERS' PUBLICATIONS

AMERICAN GAS PRODUCTS CORPORATION, 376 Lafayette Street, New York. Handbook of Ideal Gas Boilers.

While its cost is generally greater than that of other fuels, it is doubtful if any fuel is quite as desirable as gas. The advantages of its use are many. Since it is supplied only when and as used, no storage area is required; its cleanliness recommends it to housekeepers, and since the gas is paid for *after* and not *before* it is used, it is possible to keep a close check on fuel consumption and so to compensate in some measure for its higher cost. This brochure deals with the fine line of gas boilers produced by the American Radiator Company and distributed by the American Gas Products Corporation. "Home owners who heat their houses with Ideal Gas Boilers enjoy a new standard of care-free heating. The controls, though entirely mechanical in every respect, are almost human in their operation. An unsleeping eye watches the steam pressure or the water temperature and deftly regulates the fire with much more accuracy and patience than could the most experienced fireman. The gas cannot be turned on until the pilot light is burning. The gas is automatically cut off if the pilot light goes out. The gas is automatically cut off if the water (in steam boilers) falls below safe level." Intended for the use of architects and made to accord with the recommendations of the American Institute of Architects, the booklet is replete with every detail of data which an architect, engineer or builder could well desire.

PARKER RUST-PROOF COMPANY, Detroit. "The Parker Process as Applied to Building Material."

Notwithstanding its great strength,—its very name having become a synonym for strength,—iron has its characteristic weakness. Its chief enemy is rust, and unless it is prevented from rusting, iron loses its vitality and is subject to failure. It is absolutely necessary that iron be protected from rust when used for any purpose, structural or decorative. "It was the skill of Jean Tijou, an iron worker during the reign of William and Mary, that proved to a fastidious world that the cunning of wood workers could be equaled by the worker in more durable stuff,—the metals. This man made people see the latent beauty in a piece of ugly iron. Today we may see sketches of some of the beautiful grilles executed by this artist, but time demonstrates the unsubstantial nature of even iron or steel, and it is not given to us to see all the actual products of this pioneer artist's skill. Tijou and his contemporary workers probably regarded iron as the ultimate in stability, but they could not foresee the ages that would follow nor guard against the disintegrating influences that would attack the product of their art. It was the generations that came later that realized the necessity for some means of protecting the material into which so much labor and skill had been wrought. Iron did not endure, as had been hoped, because it was iron,—and rusted. Iron rusts more quickly now than then, as the present-day urge for speedier production and lower costs develops a metal of greater impurity, and susceptibility to corrosion or decay constitutes one of our most pressing present-day problems.

Although the cause of rust is well known, many methods have been tried in an effort to eliminate it, or put off as long as possible the "failing point" of rusted metal. Many types of paints, enamels and lacquers have been tried with slight success, so far as real permanency is concerned. Plating with various non-corrosive metals gives somewhat better results, but it is sometimes considered too expensive or it may have an objectionable color. Alloys of non-corrosive metals, although highly efficient, are out of the question for building purposes. This brochure deals with use of the process known as "Parkerizing" for overcoming the tendency of iron to rust. "Becoming a part of the metal itself, it cannot flake or peel off. The deep matte black color harmonizes with almost any treatment. Corrosion cannot creep under and 'lift' the coating. As the surface is microscopically etched, it affords a natural base for paint. Innumerable tests have demonstrated that it provides greater protection against rust per dollar of cost than can be had through any other known process." The booklet goes quite fully into the entire matter.

RICHARDS-WILCOX MFG. CO., Aurora, Ill. "Disappearing Door Wardrobes." Their advantages in schools.

Architects who design and plan school buildings, or in fact structures of any kind to be used by large numbers of people, well know the importance of properly solving what might be called the "wardrobe problem." Perhaps this applies in an unusual degree to schools, for many architects and educators hold that the wraps of school children should be kept not in isolated coat or cloak rooms but in places which are under the direct supervision of the teachers; this of course almost always means that the wraps must be kept in the school rooms themselves, and this brings up the problem of economizing space necessary for the opening and closing of closet doors and likewise the problem of securing proper ventilation, since unless the wraps are ventilated, odor and dampness will circulate through the classrooms. All this gives a particular interest to the booklet entitled "Disappearing Door Wardrobes" being issued by the well known Richards-Wilcox Mfg. Co. It deals with a type of wardrobe extremely economical of space, since the doors open not in the usual way but disappear *into* the wardrobe, while the problem of ventilation is solved by the wardrobes' having ventilating spaces below the doors and ventilating grilles in the tops. The doors themselves may be used as areas for blackboards of composition or real Bangor slate, the usual chalk rail extending just below. The brochure is replete with excellent illustrations.

McQUAY RADIATOR CORPORATION, Chicago. "Modern Ideas in Radiators." Information regarding radiators.

The desire for beauty and modernity is inborn in all of us. Even those who have no particular artistic ability are invariably attracted by beautiful things. Attractive surroundings in our homes are almost necessary, for the effect upon our lives of a home in good taste is far too important to be overlooked. Then, too, everyone who enters our homes unconsciously forms an opinion of us from their appearance. In the matter of radiators we have been far behind the modern trend. Too long have radiators been bulky, unsightly affairs, cluttering up good floor space, soiling walls and draperies, and tending to destroy the charm of our homes. For some years various covers and shields have been used to hide or disguise radiators. These were an improvement, but they could not add to the heating efficiency of the radiators they covered, and they were usually costly. A beautifully illustrated booklet is published by the McQuay Radiator Corporation which will give one full knowledge of modern radiators, for now comes the truly modern McQuay Radiator, unobtrusive, yet smart,—a true adornment in any home, not merely a cover or shield to disguise or hide an old fashioned radiator, but a radiator complete in itself, a radiator that is capable of warming any home comfortably and healthfully.

FLINT FAIENCE & TILE COMPANY, Flint, Mich. "A Little Book Showing Majolica Faience."

Tiles, as all architects know, are among the most useful and important of building materials. Their structural use, of course, has been highly developed owing to the ingenuity and resourcefulness of present-day manufacturers, and yet when one thinks of tiles it is likely to be in connection with their use for non-structural purposes,—for flooring or for facing walls, or else used in more decorative forms for wall panels, fireplace surrounds, wainscots, stair risers, fountains, and all the other purposes for which tiles have been used during centuries and in every country under the sun. This brochure, issued by a large firm of tile manufacturers is full of suggestions likely to be helpful to architects and interior decorators. Its illustrations in black and white deal fully with the matter of pattern or design, while other illustrations in color suggest the richness of effect which may be had when the resources of color are added to those of pattern. One particularly interesting illustration shows a tile developed in 12 different color combinations used for working out the same pattern. The booklet also gives all necessary data.

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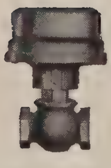

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REVIEWS AND ANNOUNCEMENTS

BEARDSLEE CHANDELIER MFG. CO., 216 South Jefferson Street, Chicago. "24 Hour Shipments."

Architects and builders who have experienced the annoyance of having to wait for the manufacturing and delivery of their lighting fixtures will appreciate this booklet issued by a well known firm of manufacturers which illustrates and lists an excellent line of fixtures which can be shipped within 24 hours after an order is received. The line includes fixtures of all the types likely to be required,—fixtures to be hung from ceilings or fixed to walls, finished in a wide variety of metals, and either extremely simple or more or less ornate to accord with the surroundings amid which they are to be used. Along with the fixtures there are to be had all the accessories necessary for their use,—shades or globes, either plain or decorated in colors which add to their effectiveness.

YOUNGSTOWN SHEET AND TUBE COMPANY, Youngstown, Ohio. "Youngstown Buckeye Conduit."

All building codes lay down specific rules for use of conduit as protection for electric wiring. Probably the chief function of conduit is to guard against danger of fire which might be caused by running the wires exposed, but it also protects against tampering with wires by amateurs, for the rapid increase in the use of electrical appliances on circuits not intended to carry the necessary loads often involves serious menace to both life and property. In this brochure the Youngstown Sheet and Tube Company presents complete data regarding its well known "Buckeye Conduit." Illustrations and diagrams of different kinds make plain the construction of the material, full information regarding sizes is given, and there are included illustrations of many well known buildings in which "Buckeye" has been installed.

HOME INCINERATOR COMPANY, Security Building, Milwaukee. "The Brick-set Incinor." Some data on its use.

Not only in hospitals but in hotels, apartment houses and individual residences is the closest attention being given to securing sanitation in every imaginable way. One of the results of this is seen in the growing practice of burning refuse of all kinds instead of merely throwing it away or else dumping it into a river, a bay, or the ocean, to pollute beaches and sometimes to infect water supplies. This publication deals with the "Brick-set Incinor," a waste disposal furnace built upon a rather ample scale and intended, as the front cover of the booklet points out "for all kinds of industrial plants and public institutions, including hotels, hospitals, municipalities, grain elevators, department stores, office buildings, restaurants, factories and clubs." The booklet deals with its subject quite fully, and illustrations and diagrams explain every detail of the Incinor's mechanism, which is easily understood.

GENERAL ELECTRIC COMPANY, Schenectady, New York. "Electric Furnaces for Industrial Use."

Although the possibilities of the metallic resistor electric furnace, as applied to various industrial processes have been recognized for a long time, it is only about ten years ago that there was evolved a type that has proved commercially practical. At that time, General Electric developed what is known as the direct-heat electric furnace. This has been perfected and applied to a multitude of industrial heating processes and is now the recognized standard. The reason for the rapid increase in the use of the electric furnace for so many purposes in preferance to all fuel-fired types may be given in two words, over-all economy. For, granted that the actual cost of energy for operating the electric furnace is higher in many cases than for the corresponding fuel-fired types, the effect of the former on the quality and quantity of the finished product more than counterbalances the difference in fuel cost. In this publication limitations of space forbid the illustration of all the industrial heating processes, but the number and variety of the applications shown are indicative of the extent to which the electric furnace is now being used.

Walker & Gillette announce their removal to the Fuller Building, 57th Street and Madison Avenue, New York.

Andrew E. Kajuk, 46 Summit Avenue, Garfield, N. J., would appreciate receiving catalogs and other publications.

Bacon & Tislow, architects and engineers, announce their removal to the Architects' & Builders' Building, 333 North Pennsylvania Street, Indianapolis.

Frank A. Sexton, formerly of the firm of Wolf, Sexton, Harper & Trueax, Inc., announces the opening of offices at 157 East Erie Street, Chicago. He desires the catalogs and other publications being issued by manufacturers.

JOHNS-MANVILLE CORPORATION, 292 Madison Avenue, New York. "Celite for Concrete."

The meaning of the terms "consistency" and "workability" is often confused, whereas a sharp distinction should be drawn between them when applied to concrete mixes. Consistency is dependent upon the water content and is measured by the slump or flow of a given mix. Workability is governed by the physical properties of the ingredients and refers to the ease with which the concrete can be properly handled and placed. "The workability of any concrete mixture is about equally benefited by one part of Celite, two parts of Kaolin, or three parts of hydrated lime such as used in these tests, if the consistency as measured by the low table is kept constant. For example, in a 1:2:4 mixture the maximum percentages recommended are about 4 per cent of Celite, 8 per cent of Kaolin, and 12 per cent of hydrated lime, by weight of cement. The improvement in workability which is had by these additions is about that which should be had from a 25 per cent increase in the cement content."

GLEASON-TIEBOUT GLASS COMPANY, 200 Fifth Avenue, New York. "Celestialite." Excellent brochure on lighting.

"Both common sense and science indicate that the best remedy for eye strain and poor vision is, more and better light." Mankind lives by light. Primitives worshiped the sun, the source of light. Civilized man had long concentrated every effort to approximate the perfect light of day with artificial light. During the last few years he has brought the electric lamp to a degree of perfection which seems phenomenal when compared with his first crude attempts to use electricity for lighting purposes. The electrical industry has made amazing progress in developing artificial lighting, at a continually decreasing cost. One dollar now buys 14 times as much light as it did 20 years ago. Today man needs light more desperately than ever before. Celestialite, which is manufactured by the Gleason-Tiebout Glass Company, is equipment which brings artificial light closer to daylight. It is advisely named, for its light has the softness and radiance of celestial light without the glare, harshness or color distortion of ordinary artificial lighting equipment, because Celestialite alone is truly next to daylight." This beautifully illustrated booklet will supply one with information concerning Celestialite, its use and its high efficiency at a low cost.

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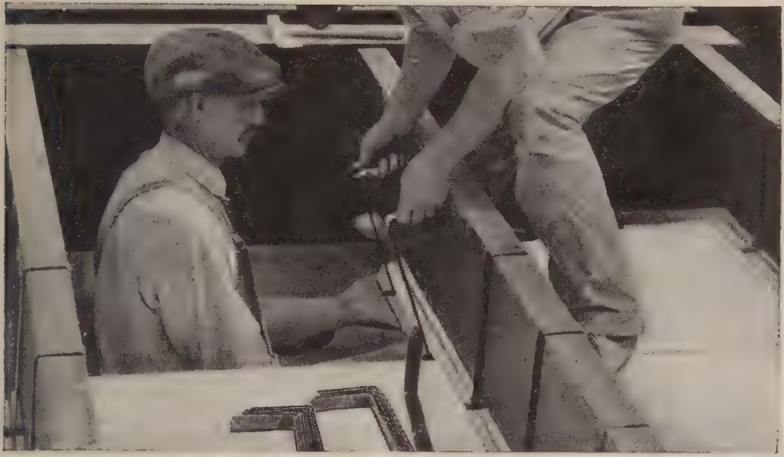
Speed winter construction with GYPSTEEL Pre-Cast Floors



Suspending Ceiling Slabs by hangers from steel floor members, which may be rolled shapes or open-web welded joists.

Laying Floor Slabs on top of steel members and tying steel rods together.

No forms
No waiting
No salamanders

IF YOU want to work right on through the winter months with warm weather speed, then you want Gypsteel Pre-Cast Floors.

Because—no forms are used. Pre-Cast gypsum slabs for the floors and ceilings are delivered to the job all ready to be put in place.

Ceiling slabs are suspended from steel floor members by hangers, as shown in top photo to the left. Ceilings are grouted.

Then floor slabs are placed on steel members, as shown in lower photo; they're grouted; and the floor is ready for finish.

Installation Is Rapid

It's as simple as that. Any weather in which men can work is Gypsteel weather. No forms. No water (except very small amount for the grout). No special precautions. All of which means *no waiting.*

And Gypsteel Floor Construction usually costs no more.

We'll be glad to send our catalog, telling all about it.

GYPSTEEL

Pre-Cast Fireproof Floors and Ceilings
made only by

General Offices:
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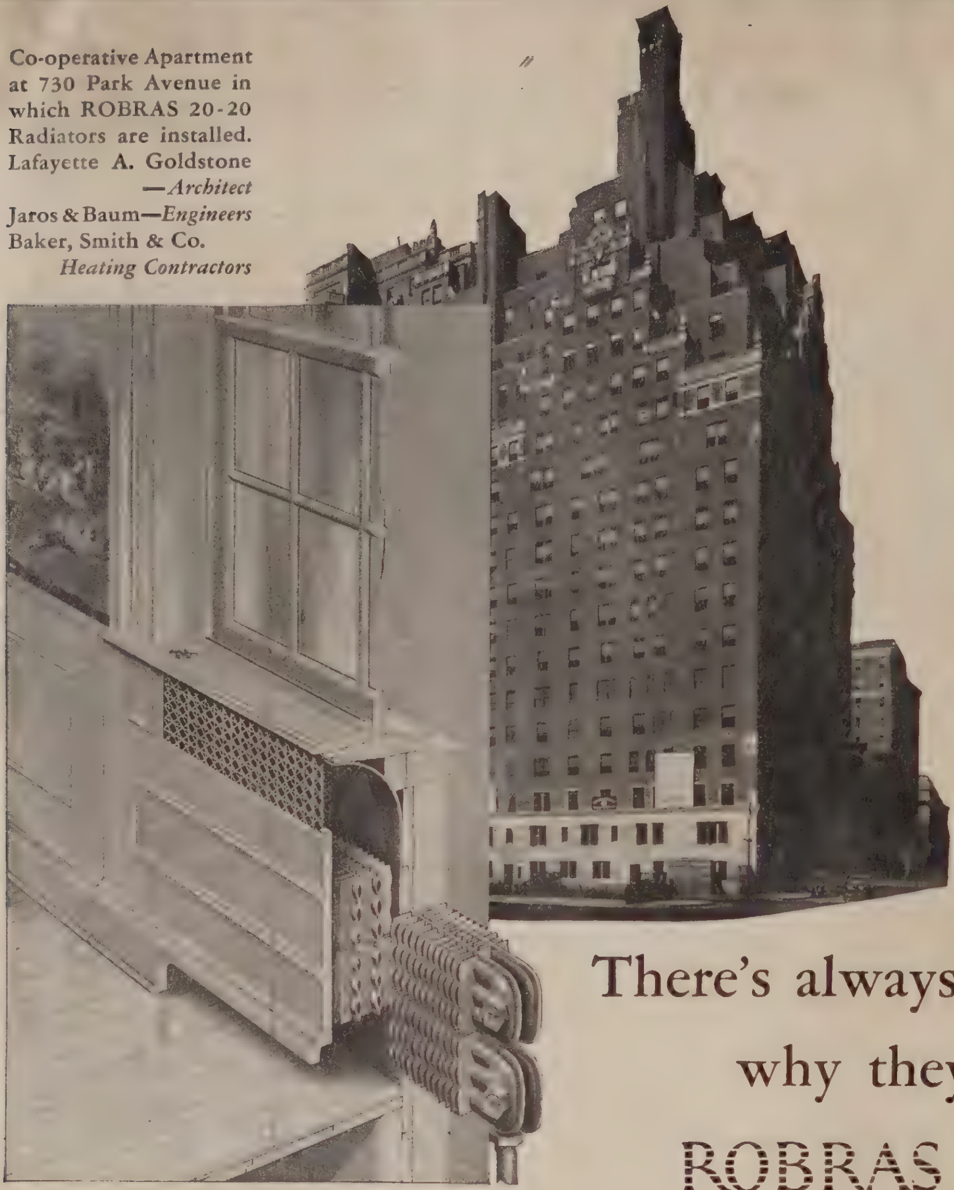

Method of installing ROBRAS 20-20 Radiators under the window, in a wall four inches deep.

There's always a REASON why they use ROBRAS 20-20's

THERE'S always a reason why the builders of the best equipped apartments use ROBRAS 20-20 Radiators. Sometimes the reason is one of aesthetics. Sometimes it is one of practicality. Sometimes it is a combination of both.

However, with ROBRAS 20-20's *in the wall, out of sight,* and *out of the way* no tenant can have any what-shall-I-do-with-the-radiator problem.

This means satisfied tenants, full apartments and happy owners.

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